# POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

A MAGAZINE FOR THE PROMOTION OF PRIVATE FLYING AND COMMERCIAL AVIATION

Volume XVIII | JUNE, 1936 | Number 6


## TABLE OF CONTENTS

### FEATURE ARTICLES


An Airy Chat With the Editor ..... 400
Principles of Military Formation Flying ..... 402
Billy Mitchell—Aerial Achilles ..... 407
To Europe by Airliner ..... 409
A Few Japanese Navy Planes ..... 411
". . . . Clear and Unlimited" ..... 413
Ford and the Lightplane ..... 415
Flying the Hump is a Hazard ..... 417
Death Ever Lurks at the Pylons ..... 419
The Wright Cyclone "G" Engine ..... 420
A History of the Cyclone "G" ..... 421
Lt. Marcel Viallet—Premier Hard Luck Pilot ..... 423
Benny Howard's New Ship ..... 425
Stunting With the Gates Circus ..... 427
Strength of Materials Made Painless ..... 429
Just Another Lightplane Roost ..... 431
POPULAR AVIATION'S Gas Model Plane ..... 434
Flying Gas Models 'Way Out West ..... 436
Building the Northrop Attack (Model) ..... 437
U. S. Army Air Corps Insignia ..... 442


### PICK OF THE BRIEFS


Capt. James Martin Files Suit ..... 410
Flea is Now in Production ..... 412
Another Aviation Cross-Word Puzzle ..... 412
Attack Aviation in U. S. ..... 414
Wonder If Bellanca Ever Saw This? ..... 416
Wind-Tunnel Completed at Parks College ..... 416
Rah-Rah-Rah—Curtiss Class of 1912 ..... 418
Number of Lightplanes Increases ..... 418
New Dope of the McGaffey "Aviate" ..... 424
Nomograph for Take-Off Distance ..... 426
They're Off at the 1910 Air Derby ..... 428
View of the Lunken Airport ..... 428
. . . and They Build Them in Honolulu ..... 432
A Steam Engine Starter for Planes ..... 432
Air Corps Slanguage ..... 432
Three New Lightplane Engines ..... 433



Copyright, 1936
ZIFF-DAVIS PUBLISHING COMPANY



POPULAR AVIATION, Volume 18. Number 6. June, 1936. Published monthly by Ziff-Davis Publishing Company, at 608 South Dearborn Street, Chicago, U. S. A. William B. Ziff, Publisher; B. G. Davis, Editor; John B. Rathbun, Managing Editor. New York Office, 381 Fourth Ave., New York City. Subscription $2.50 per year, single copies, 25 cents; foreign postage, $1.00 per year extra. Contributors are especially advised to retain copy of their contributions, which must be accompanied by return postage. All such material will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Any copy accepted is subject to revision or changes to meet the requirements of this publication. Payment for copy used will be made at our current rates. Photos and drawings will be considered as constituting a part of the manuscript in making payment unless otherwise specified. Entered as second class matter, January 24, 1933, at the Post Office, Chicago, Ill., under the act of March 3, 1879.



XUM

# Fundamental Principles of

*Official Army Air Corps Photo*

**Bombardment flight in diamond formation. Spaced just right for mutual gunnery protection against enemy pursuit attacks.**

*Official Army Air Corps Photo*

**A bombardment squadron in Javelin formation. The first plane has passed out of view.**

*Official Army Air Corps Photo*

**A nine-plane flight in typical pursuit formation, echeloned to left, stepped up. This is the ideal formation for an attack on a hostile plane to the right of the leader.**

by

T-2003

Expert on Military Aviation and Air Transport

THE brewery horses, the gliders and the delayed parachute jumper had all strutted their stuff before the "crash-minded spectators" at the National (County F) Air Races. Through the oft-mentioned courtesy of the Katz Pajama Company a crooner moaned into the mike. Things, however, were dragging, dull, time-killing, stupid, when . . .

Well, ladies and gentlemen, over that field blew two of the finest examples of showmanship, piloting, air discipline and other aerial what-not, "ever witnessed by mortal man or beast" as the excited announcer barked after snatching the mike from the startled crooner's hand.

The Three Men on a Flying Trapeze, the low flyers were called and as they flew low across the airport this trio slow-rolled, not individually but as if the three P12s were one ship. Each of the outer planes was a wing and the leader was the center section of that roll.

A shrill whine aloft and the Flying Trapezists departed unnoticed for there in the high blue, a mile above the field, three squadrons of the First Pursuit Group were doing things in formation that caused more than one spectator to wonder if the Air Corps wasn't spending its time training for showmanship instead of aerial defense.

But, spectacular as it appeared to the groundlings, the First Pursuit Group was only going through a bit of routine practice of an attack on a hostile bombardment formation, minus the latter. It was just another form of air tactics, and not a senseless case of exhibitionism, as one of America's foremost editorial writers would have you believe in his occasional tirades against formation flying.

"Since the days of the Somme, when both the Allies and the Germans started the use of large masses of pursuit airplanes * * * the work of the individual pursuit pilot has been greatly merged into those of the well organized pursuit formation," states the Pursuit Aviation text of the Air Corps Tactical School.

One can easily imagine the result if large numbers of individual pursuit pilots were sent aloft one at a time or in very small formations and met up with a well co-ordinated squadron or group of enemy pursuiters. Or the lack of results if only individual pursuiters attempted to attack a close formation of enemy bombers at will or without co-ordination of effort. This leads us to infer that bombardment airplanes also fly forma-

# Military Formation Flying

tion, which indeed they do, except under certain conditions in night attacks.

Attack airplanes also fly formation. Observation planes seldom fly in that manner when on observation missions, but they find it convenient to fly formation when moving from one field to another.

For the three types of military aviation that normally fly formation on tactical missions, the following are the primary reasons for such flying on their part:

**Pursuit:**—Sweeping the air for enemy aircraft, for most effective attack against various types of enemy aircraft or formations thereof, and for defense against larger enemy pursuit forces.

**Bombardment:**—For defense against enemy pursuit aviation and for defense against enemy anti-aircraft artillery.

**Attack:**—For attack against enemy ground personnel or establishments and for defense against hostile pursuit aviation.

Definitions of various formation terms will help the reader to understand such phrases as "the group went from the group wedge, stepped down, into the route column, stepped up." So here they are:—

**Element:**—Two or three planes.

**Flight:**—Two or three elements.

**Squadron:**—Two or three flights. Sizes of squadron formations vary generally as follows,—pursuit from 18-24 planes, attack from 12-18 planes, bombardment and observation, either 9 or 10 planes.

**Group:**—Two to four squadrons.

**Echeloned:** — Offset. Echeloned to right (looking up at formation) means the plane, flight or squadron is to the right of the plane, flight or squadron in front of it. Echeloned to left, when they are to left of the one in front.

**Stepped up:**—Rear planes, flights or squadrons higher in altitude than those in front.

**Stepped down:**—Lower than those in front.

**Vee:**—Just like you'd imagine, a V.

**Wedge:**—A massed formation like a solid triangle with point in the lead.

**Column:**—One flight, or squadron, directly behind the other.

**Route:**—On the way to a mission when enemy air attack is not likely.

The most elaborate formation of all is the pursuit used for screening, or sweeping the air of enemy aircraft. Such a group formation of four squadrons may cover an area from three to eighteen square miles.

It consists of three squadrons in column; each squadron of two flights and the flights echeloned 300 yards to the left rear with an interval of 300 yards from one flight to the flight behind it. A fourth squadron in the group is split up into three-plane elements and these

*Official Army Air Corps Photo*

**Army pilots of the 27th Pursuit Squadron bring their Boeing P-12E planes up on the line while training near Selfridge Field, Mich.**

*Official Army Air Corps Photo*

**Pilots of the 27th Pursuit Squadron demonstrate the column of Vee's formation. Each flight of three planes is echeloned upward and to the right.**

*Official Army Air Corps Photo*

**A bombardment squadron in Javelin formation, just issuing from a cloudbank.**

elements fly from one to three miles from the axis of the formation and act as scouts for the group commander.

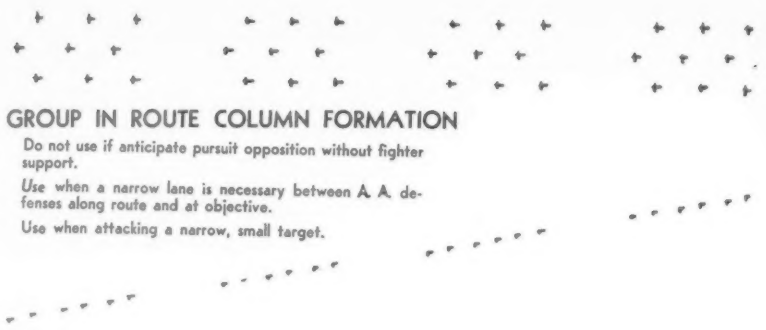
The simpler formations, of course, are the V's. World War formations were generally of this character. When a V is of more than three planes it is difficult to maneuver. Indeed, a flight of nine pursuit planes, of three elements in V with planes also in V, sometimes resorts to the "cross-over turn" to turn 90 degrees quickly.

Echeloned formations are usually most easy to maneuver, and are safer when coming in to land of flying with other formations. The leader of his element of flight takes distance from the closest airplane of the neighboring or enemy formation, or the hangar line or other obstruction when coming in for formation landing, and the others step back and up from the leader.

Most of the formations we see at air races and other "spectacle events" are flown with the airplanes too closely together for combat or other tactical use. In the pursuit or attack unit the planes of each two or three plane element should be just so far apart that each pilot can aim his forward guns (by maneuvering his plane) with both eyes open and not be worried too much by the proximity of the other plane or planes.

In the bombardment formation the planes are so spaced that the guns of one plane can fire in protection of its neighbors when attacked by hostile pursuit aviation, or upon entering anti-aircraft artillery fire they should be so spaced that one shell burst will not get *more* than one victim.

Not that trick formation flying isn't good practice for the pilot. It is excellent practice, but merely in pilotage. It has little use in time of war, when the typical formation will be spread out, generally of irregular shape such as the bombardment group stagger formation.



**GROUP IN ROUTE COLUMN FORMATION**

Do not use if anticipate pursuit opposition without fighter support.

*Use* when a narrow lane is necessary between A. A. defenses along route and at objective.

Use when attacking a narrow, small target.

This looks sloppy, but is effective against anti-aircraft fire from the ground, especially with the squadrons in the group making the whole thing sloppier still by shifting position and changing speed, altitude and direction to confuse the enemy ground gunners.

The universal use of radio in army airplanes makes the control of formations an easy matter, although radio is not used in a well trained outfit as much for this purpose as you would imagine. With a number of new men in a squadron the radio gets as good a workout as the pilots, and each pilot soon learns his faults, via his earphones, from the microphone of his squadron or flight commander.

Without radio a nod of the head, a flip of the ailerons, elevators or rudder or a hand-tap on the windshield can convey a world of meaning to one's formation mates. No universal system of signals has been adopted and retained for long by the Air Corps. Each group has its own, and their use depends on the degree of training of the group's pilots. Some typical signals are:

**Nod of head sideways:**—Turn in that direction.

**Arm thrust out sideways:**—Go into echelon on that side.

**Rocking plane:**—Close up, or form Vee's.

**Zooming several times:**—Break up formation.

**Arm thrust overhead:**—Get ready to attack.

**Patting windshield:**—Get ready to land.

A smooth maneuver in formation is a joy to witness. Take the cross-over turn. A pursuit squadron of 18 planes will be flying in a Vee'd elements in V with flights in right echelon formation.

This means that the three airplanes in each trio (element) will be in a V, and the three elements in each flight will be in a V, with one nine-plane flight staggered to the right and rear of the leading flight.

The squadron leader dips a right wing twice as a signal, waits for about three seconds, then pulls a 90-degree turn to the right. He has signaled for a right-hand cross-over. The pilot on his right flies straight ahead, crosses the leader's path, then makes a right turn and finds himself recovering on the leader's left.

The man originally on the left makes a right turn simultaneously with the leader and recovers on the leader's right. This procedure gives a quicker turn than the orthodox bank-and-turn. The right and left hand elements in the flight take a path as if they were individual airplanes making cross-over turns as elements, and the planes in each such element make cross-over turns within their own element.

This sounds rather complicated, but is not half so difficult to understand as the reason why a flight leader once signaled for a left-hand cross-over and then pulled around to the right Or as difficult as expecting the members of the flight to come out of it alive, which they actually did.

The author was swapping lies in front of the Operations Office when it happened, and it looked like the sky was full of whole airplanes, fragments thereof, falling wingless fuselages and blossoming parachutes. Formation flying can be just like that.

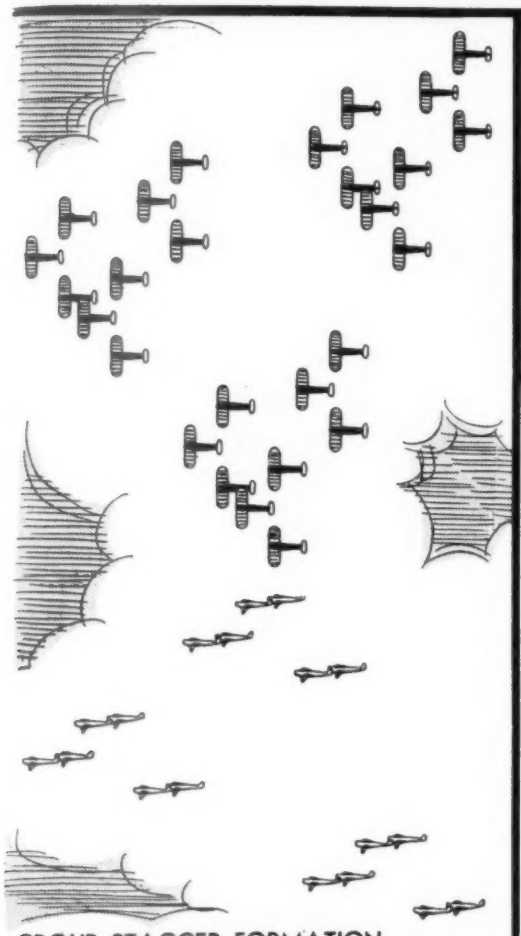
END.

*Official Army Air Corps Photo*

**A trio of P-16's, two-seater pursuit planes, attacking from the rear of a cloudbank.**

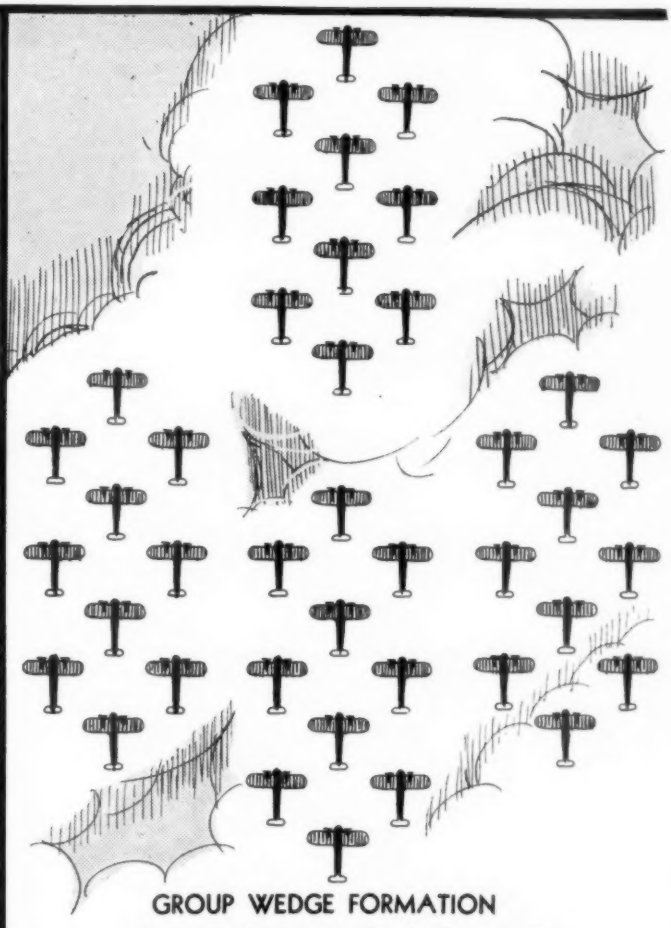
# Some Standard Flight Formations

(As practiced by the U. S. Army Air Corps)



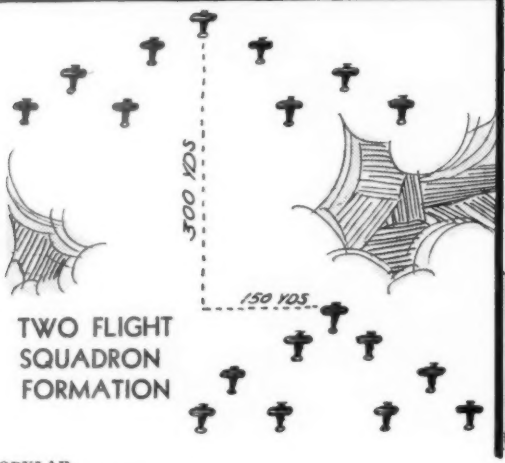
## GROUP STAGGER FORMATION

Bombers use this when they have no pursuit protection and expect hostile pursuit attack, or when entering A. A. fire zone. Flights and squadrons constantly shift altitude and position.

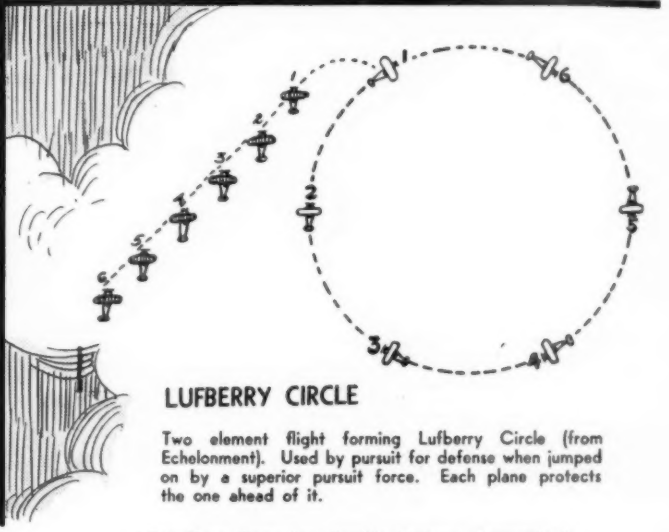


## GROUP WEDGE FORMATION

Bombers use this formation when they have pursuit protection but still expect hostile pursuit attack.




## TWO FLIGHT SQUADRON FORMATION



## LUFBERRY CIRCLE

Two element flight forming Lufberry Circle (from Echelonment). Used by pursuit for defense when jumped on by a superior pursuit force. Each plane protects the one ahead of it.

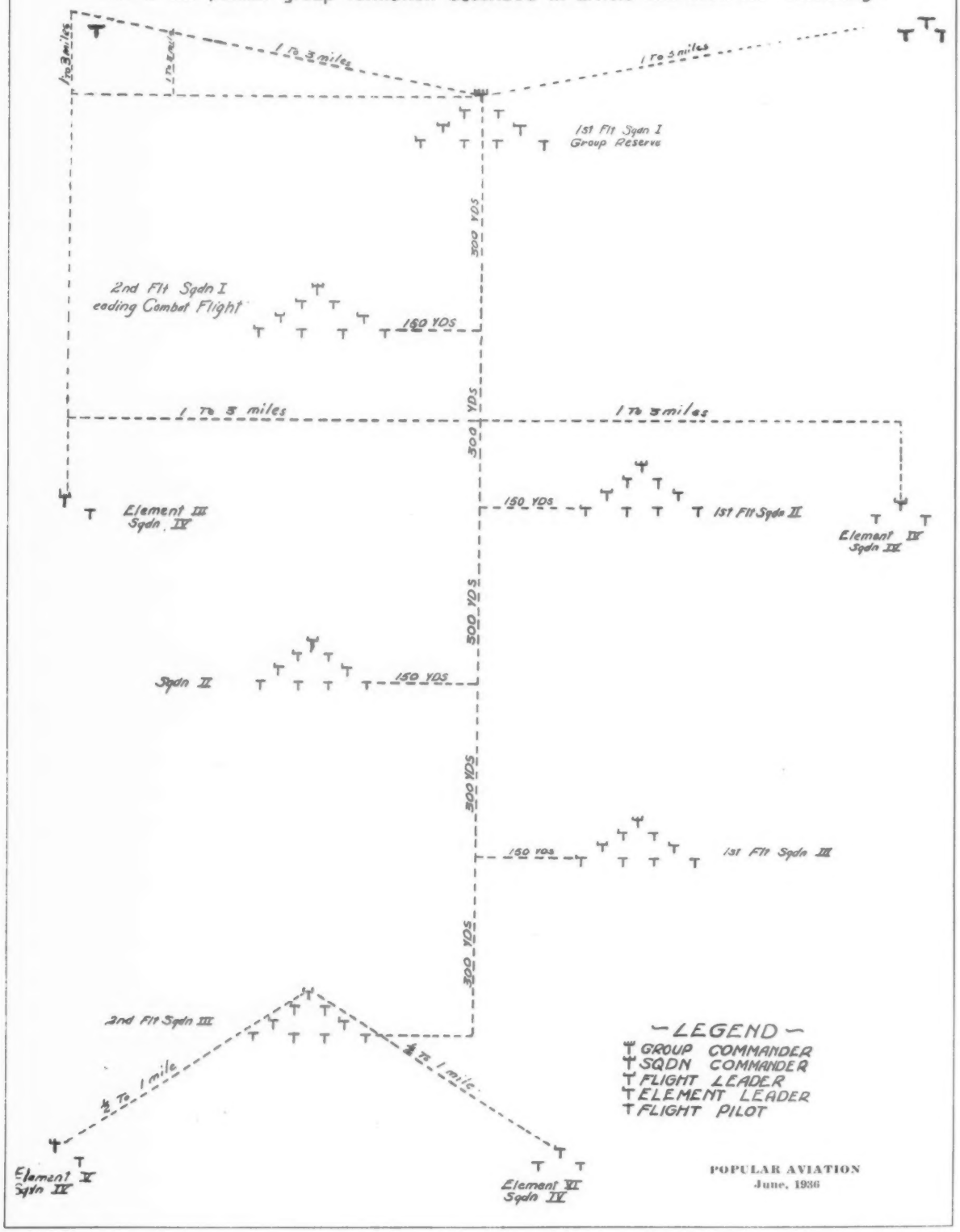


(*See Next Page for Double Column Formation*)

# GROUP FORMATION (DOUBLE COLUMN)

(Two Flight Squadrons)

This is the pursuit group formation described in article and used tor "screening".




POPULAR AVIATION
June, 1936

# Billy Mitchell: Aerial Achilles

by JAMES FARBER

**General William Mitchell, the outstanding figure in American military aviation is no more, but we trust that his spirit of ambition, fairness and constructiveness will go marching on. We, the Staff of POPULAR AVIATION have a deep and enduring regard for the memory of this man who threw convention and caution to the four winds of heaven.**

IT WAS a hard climb. Below was the Miami river, its broad bosom swollen by spring rains. Below, too, were housetops, peril of every pilot who takes off from an airport located close to a residential section of a large city. Crosscurrent winds were blowing too, which made it doubly difficult; a heavy bomber, laden with equipment and human freight, was taking off from McCook Field, Dayton, Ohio.

A few feet in the air—then the wings wobbled. In a terrifying split second, the ponderous nose dipped for the ghastly plunge into the river. A few moments elapse. Two men have raced to the bank, thrown off service blouses, leaped into the cold waters. Their heads bob—then disappear. Arduously but tirelessly they dive like sharks, time and again, to the muddy bottom. In the end, the results of their work: five dead bodies.

One of those rescuers is William Lendrum Mitchell, 48 years old, a brigadier general in the United States Army, a hard-flying, iron-nerved, restive individual who fought his way to the elect group of the Army's Supreme Command. Afraid of no man or circumstance, praised and maligned during his stormy career, cursed and punished by his superiors and cheered by his multitudinous civilian audience, it was typical of Billy Mitchell that he forgot all about the general's stars on his shoulders and braved icy torrents to succor men in trouble.

No eulogy is intended to be here written about General "Billy" Mitchell. It would be too open to sharply pointed attack by his innumerable enemies; an attack which would have too much justice in it for the purpose of eulogy. We'll save for clergymen the business of the eulogium. Herein we shall consider what the man was, what he did and how right he was.

That incident at Dayton was not the only time his superiors knew him for a man of courage. When General John J. Pershing sat down one day at Chaumont, France to approve some citations for conspicuous gallantry in action, he read one worded as follows:

". . . for repeated acts of heroism in action near Noyon . . . the Marne . . . and the St. Mihiel salient . . . setting a personal example to American aviators. . . ." Pershing signed it.

It was Billy Mitchell's citation for the coveted D.S.C. Back of it lay the fact that on each occasion the impetuous general had turned in recommendations based on his daring scouting trips that changed A.E.F. aerial battle tactics, ground strategy and coordinated Allied operations.

This restless flying general simply couldn't keep out of danger. Foulois was the same way. Neither had any business making reconnaissance tours over areas swept by Archy shell fire. It's a wonder both weren't subjected to military court proceedings for "endangering the life of a commanding general"—as well might have been done. Both were cited instead.

Blackjack Pershing himself selected Billy Mitchell to command the A.E.F. air forces. He was what the army, in its politics, called a "Pershing man" and right there you have the explanation of

**The late General William L. Mitchell, former Commander of the A.E.F. Air Forces and best known of wartime air officers.**

a lot of things. While Pershing rode in the saddle of high command, Billy Mitchell spouted off as often as he pleased. When Pershing stepped down, Billy was bound to be in for it. It just had to happen.

One evening, Mitchell was flying across the treacherous Alleghanies. He was looking for Moundsville, the gasoline haven of flyers for years. He saw a nice green lawn. It looked flat enough to land on, so he sat down on it. As his prop flashed to a stop, a man came running up to the ship. "Stranger," he panted, "I must congratulate you on the novel way you've chosen to enter our famous institution."

"Why, where the hell am I?" quoth the puzzled Mitchell.

"Don't you know? Why, you're in a Pennsylvania State Asylum. I thought you knew it."

Mitchell didn't but when later on he was in the "grease," critics whose cases had to be bolstered by mud-slinging said he ought to have stayed there. And that is the sample of invective hurled at him each time he dropped his verbal bombs into the camp of the conservatives and the die-hards.

Let us glance for a moment at the background and career that brought him to the attention of the public and to the foreground in American aeronautics.

He came from a distinguished family Possibly he inherited a lot from his father who as a Democrat scrapped his way into the United States Senate from a state as predominantly G.O.P. as Pennsylvania. It was certainly an example for young Billy to watch. Further back, however, a branch of the Clan Macgregor in Scotland was driven from its native heather to find a new and greener field where assassination wasn't part of the atmosphere. There was no point in facing insuperable odds and certain death.

The name Mitchell was assumed. In America Sandy (Macgregor) Mitchell became allied with the famous Silent Smith in Chicago. He helped build up the C. M. & St. P. railroad, financed the first plant of the Armour company, and founded the Northwestern Fire Insurance company, only underwriting fire company to pay off completely after the Chicago fire.

His son John, Billy's father, bought and presented its first steam drawbridge to Milwaukee, gave land for the Soldiers' Home and Mitchell park, supplied free textbooks for needy children for years, and endowed the University of Wisconsin with 36 free scholarships.

This is the stock which produced Billy Mitchell. After his third year in college, Billy joined the regiment in which his father had marched off for the Civil War, the First Wisconsin Infantry. That was when the Spanish-American War broke out. Afterward, in the Philippines, he won his commission and fought Aguinaldo, famous insurrecto.

Twenty-five years later, as assistant chief of the Army Air Corps, he flew the aging rebel over battlegrounds each recalled so vividly.

He became an inspector at the staff school—despite not being a West Pointer, supervised construction of 800 miles of telegraph wires in Alaska and the establishment of Cuba's radio stations, then in 1914 went to Europe to supplement his Boxer Rebellion experience as a military observer.

From what he saw during the early days of the war he became sold on the idea that the air force was to play a vital part in modern warfare. In other words, he was well primed when Pershing made him an air chieftain. He spoke French, German, Italian and Spanish fluently, was a good man to have around.

From the first Billy Mitchell was a

XUM

showman. He reminds one of Roscoe Turner. Roscoe, you know, is a great lad for uniforms. So was Billy Mitchell. He wore lemonade-colored breeches with his tunic, blatantly patched pockets and all the ribbons he was entitled to. He drove the fastest planes and the fastest automobiles a little bit faster than the other fellow. When A.E.F. men sewed on three gold stripes for 18 months' service abroad, Billy sewed on four.

These things had advantages but they didn't endear him to comrades-in-arms of the other branches of the service. They had their effects, which later cropped out in the hatred and animosity with which his bold heretical assertions were greeted by the military moguls of the nation.

The limelight then must be considered as a great factor in anything Billy Mitchell said or did. But if he played to the grandstand, it was never obvious, always with finesse and usually only open to the stabs of his severest critics and worst enemies. His own prominence attracted others of prominence. They liked to be around him.

He took Will Rogers for a flight one afternoon at Bolling field. On their return, Rogers got both into front page positions on newspapers all over the country by remarking to assembled news men, "Billy, you should take Cal (Coolidge) up in this machine. Then he couldn't talk so much."

He took Will Hays on a Washington-New York hop and made it a point to show the Postmaster General some of the thousands of tons of Shipping Board vessels lying idle in obscure harbors. Hays was so impressed that he went into action on the matter and the Board began salvaging these ghost ships.

Only once did Billy doubt whether he should take the responsibility of entertaining a celebrity. That was at Coblentz, Germany, when the A.E.F. had moved into enemy territory as an army of occupation. The then Prince of Wales visited the aerodrome and requested a place to stay and a flight over the Moselle country. Billy got the job. He liked it, but thought seriously at first of dodging the assignment.

During the flight the present king of England stood up in the rear cockpit and had a grand time as Billy pushed the nose of their plane over miles of vineyards and acres of feudal castle estates. He was glad when he landed safely and only had to supervise entertainment details for his royal visitor. Later, at Buckingham Palace, King George called Billy Mitchell into an anteroom for a long chat, not a little of which concerned the future monarch of the empire.

All these facts and details, however, are of significance in considering the case of Billy Mitchell only as they throw light upon the man himself and his career. What really interests the public is his stormy experiences as a high ranking army officer who got what amounted to a $50,000 fine for talking out of turn—'way out of turn.

During his lifetime Billy Mitchell was tried twice. That one time that everyone knows about; and another that is now only a record in an old Virginia courthouse—one incidentally that has a bit of humor behind it.

Billy and the mayor of Hampton, Virginia went duck hunting one time and were arrested by game wardens who charged them with using sinkboxes without proper licenses. When the time came for the court appearance, Billy flew over from Washington. He couldn't find a landing spot and went home. The next day, after more circling, he found a place. He was greeted by a delega-

**General Mitchell (right) and Major Harold S. Martin, former chief engineer of McCook Field.**

tion of dour citizens.

They told him he had deprived the town of its bootleg liquor supply for 24 hours—since the bootleggers had seen him circling around and thought he was a flying prohibition officer. The delegation was somewhat mollified to learn who and what Billy was and no doubt the grapevine telegraph carried word to the distressed personnel of the rum fleet with subsequent restoration of the spirit supply.

At the trial, Mitchell and his friend were acquitted.

But at a trial which took place in a Washington warehouse beginning in October, 1925, Mitchell took a beating which will remain classic in army tradition. Records show that 1,400,000 words were employed by the two sides in fighting it out.

Twenty-two years to the day after the Wright brothers made their first successful flight and gave to the world the wartime and peacetime instrument which was to prove the plaything and the career of Brigadier General William Lendrum Mitchell, a military court-martial threw this illustrious aviator from the ranks of the army—and deprived him of any further opportunity to develop the flying machine to which he and the Wrights made such contributions.

Lined up against Mitchell were, among others, agitators from the steel and oil interests of the nation. The steel men knew the profits from sales of $45,000,000 battleships as against the sale of aircraft. The oil men, shortsightedly, failed to realize that a moderately developed air reserve would bring more gasoline and oil sales than the whole navy combined.

Allied, too, against their haranguer were the moguls of the other arms of the service each with his reason for wishing the personal defeat of Mitchell and the explosion of the conception of a unified air force.

The match which lit the powder train was Billy's remarks after the Shenandoah disaster. At the time he was air officer at San Antonio. He said the loss of this monster of the skies was due to "the incompetence, criminal negligence and almost treasonable administration of national defense by the War and Navy departments." This was on September 5, 1925. He was brought to trial October 28.

He had got away with his predictions and curses before a Congressional investigation committee, although he lost his grade as a B.G. and became a colonel once again. This time, however, he really said something that struck home, just or unjust.

The trial dragged on for weeks. Prosecution counsel denounced Billy as a "self-advertising demagogue." Defense was equally as vituperative. But the prosecution won, declared itself in a lenient humor and smashed Mitchell with suspension of rank, all privileges, allowances and pay for five years and forbade him to leave the country without permission of the Secretary of War.

Everyone shook hands afterward. It was "Goodbye, Billy," "Sorry to see you go, Bill," etc. And it ended his army career. He had violated the sacrosanct Article of War 96 and the faults of the All Highest had been properly whitewashed. There was nothing to do but resign. Billy did so. It had cost him $50,000 to talk out loud: that is a conservative estimate of the value of five years of service to an officer of the rank of general. He had grabbed the Navy by the tail but in the last analysis the die-hards and bureaucrats won: they had him coming and going when they slapped their sentence on him.

Three thousand years ago Achilles, ward lord of Greece, was rebuked. He sulked in his tent. Less than a decade ago Billy Mitchell, aerial Achilles of a new day and a war lord in his own right, was rebuked—and sulked not. Instead did he go forth and join battle with his adversaries in his role of civilian—in which he could talk and preach and fulminate to his heart's delight.

Mitchell fought for a unified air force. The Army and Navy do not want such an organization. They desire the services of flyers in furtherance of their own functions. They do not believe that a

(*Continued on page 467*)

# To Europe by Airliner

by MAX KARANT

**All signs point to the establishment of scheduled airline operations between the United States, England and Europe within a very short time. Super-planes are under construction for this service and the first trial flights will take place in the near future.**

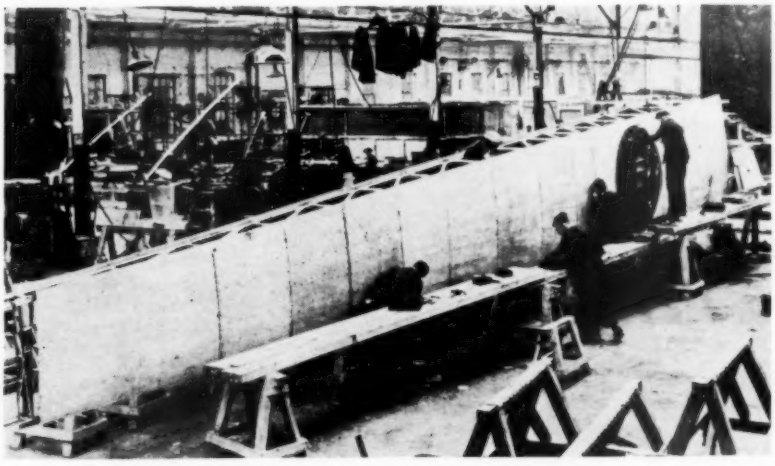
PROGRESS in American aeronautics always has and probably always will take great, breath-taking forward strides; breath-taking to a blase American public that usually refuses to be jarred from its old, matter-of-fact routine life.

Since a quiet, methodical, air-minded young man took over the then-stupendous airline between New York and Buenos Aires, however, American citizens—air-minded or otherwise—have received one progressive jolt after another. First, they discovered that this young man was offering them comfortable flying-boat transportation from Manhattan to the southernmost metropolis of South America, offering them this long, tedious steamship trip in a luxurious, speeding airliner instead of a plodding ocean liner—and at one-third the time.

When this young man expanded his company's activities, lopped off the New York terminal and made Miami the line's main base in the United States, the majority of N. Y. R. B. A. "followers" forgot the company in the close-to-home rush of extensive improvements and record-breaking advances of continental American airlines.

Consolidating N. Y. R. B. A. (New York, Rio de Janiero and Buenos Aires) with the new South American airline system he had opened, the remarkable young man of aviation—Juan Terry Trippe—named his whole layout Pan-American Airways System.

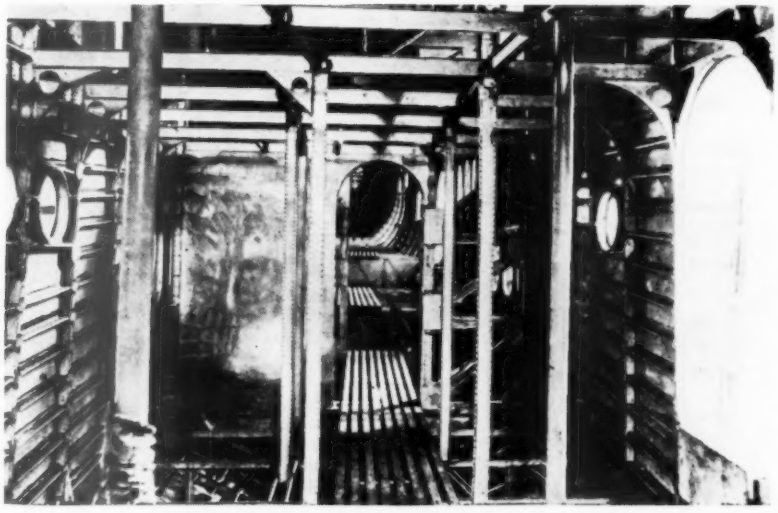
That is the name that has flabbergasted Americans since the day it was originated. Caribbean flights . . . over the Andes . . . expansion to Haiti, Puerto Rico, the Virgin Islands . . . up into Alaska . . . over to China . . .



One of the wings for a trans-Atlantic liner now under construction at Rochester, Kent, England. England is rushing work on these leviathans of the air.

Today, the gigantic coup in world news that has made Pan American Airways a household word uttered worshipfully by Americans, enviously by English, French, Dutch and Germans and jealously by Japan is: Trans-Pacific via China Clipper.

With one sweep, after silent years of methodical preparation, Juan Trippe shoved big-time international aviation into temporary oblivion with his mammoth, record-breaking trans-oceanic Sikorsky and Martin Clippers and with his almost fantastic string of radio-base outpost islands across the Pacific to the Philippines to connect with his already established China National Airways.



An interior view of the structural work in the cabin of an English trans-Atlantic airliner. The total loaded weight of this ship will be approximately 39,500 pounds.

To say that Pan American actually backed other international aviation activities into temporary oblivion with its trans-Pacific division is perhaps denying that company even more credit than has been given it. As was pointed out in the article on Pan American's trans-Pacific division in the February issue of POPULAR AVIATION, Juan Trippe always has dreamed of a scheduled airline between American shores and Europe across the Atlantic.

The trans-Atlantic line has been in Pan American plans long before trans-Pacific. But trans-Pacific came first because of the lack of red tape and petty governmental interferences on the part of foreign powers that happened to control vital refueling landing bases in mid-Pacific. Simply because there were no "foreign powers" involved.

The trans-Pacific division is based on Hawaii, Midway, Wake, Guam and the Philippines, every one of which is either controlled by or under the protection of the United States government. Japan, militaristically alarmed, futilely accused the American company of establishing "war bases" in the Pacific. This, however, was the limit of international opposition to the United States-to-China airline.

The Atlantic has been an entirely different story. To safely and regularly make trans-Atlantic passenger flights, stops are necessary at several islands controlled by foreign powers or on alien

mainlands themselves. Here it was that Trippe got his most crushing defeat.

Two basic routes have been charted across the Atlantic: one for winter operations and one for summer. The former route, by far the most expensive to operate, extends from New York (or any optional seaport along the Atlantic coast) to Bermuda, a British possession; the Azores, Portuguese territory; Portugal itself and the British mainland. The summer route also starts from New York and touches Canada, either Newfoundland or Nova Scotia or both, Ireland and the London terminal.

Obviously, most of the opposition to Pan American's plans was strictly from the British. Portugal, although she held out on the Azores permit, has few aims if any, toward international air supremacy. The English government, holding a protective arm around its heavily subsidized Imperial Airways, refused to give the Americans permission to use British possessions as landing or refueling bases.

Britain's stubborn selfishness suddenly took a turn for the better recently. Apparently smarting at the outstanding success of the Pan American spanning of the Pacific, Imperial Airways officials came to life—and to Pan American officials.

Would the Americans care to come to some agreement on a trans-Atlantic route? Would they care to see a trans-Atlantic airline opened for business early in 1937? Would they care to start test flights over the two routes in the summer of 1936? President Trippe and other officials of the pioncering American company immediately "saw the light."

Obviously, the "agreement" meant a nice, juicy cut on the Pan American project for the British company. "Payment for the use of their islands." It was thus it turned out. Probably seeing the futility of defying the Britishers, the Americans agreed.

So it is that present plans for the opening of the trans-Atlantic line call for joint operation of the system by both the British and American companies on the four-round-trips-weekly schedule. Both plan to carry mail; both will split up schedules so that each line will get an even share of the business. For instance, an American ship will carry passengers from New York to London while a British ship will make the return flight. The first test flights already have been slated for some time during the summer of this year.

Work is progressing rapidly on the future trans-Atlantic airliners. At Rochester, Kent, England, the first of twenty-nine trans-Atlantic planes is now under construction at a total cost of approximately $7,500,000. Not much data is now available, but it is said that the new English ships will weigh about 39,500 pounds in flying order and that, in addition to the huge supply of gasoline, there will be a 16,000 pound surplus for mail, passengers, crew and freight.

While no particular information has been given out from the American side, it is assumed that the "Clipper Ships", already developed by Pan American will be employed on the first flights at least. To judge from their successful flights over the Pacific, and over longer stretches of water than they will encounter on the Atlantic, there will be but little revision in the design or performance necessary.

But, as the Zeppelin company early discovered in its flights across the south Atlantic, it is easier and quicker to design and develop a new ship than it is to develop a thoroughly trained and competent personnel for such long overwater flights. To fly the Atlantic once, a la Lindbergh, carries the element of luck in no small degree, but to fly the Atlantic on schedule, month after month, is something very different.

Our first need, aside from the personnel and engines, will be thoroughly dependable navigational instruments, that are both rugged and sensitive and this is something that we still lack and probably will lack for some time.

Pilots of the Imperial Airways who are to make the experimental flights this year are now undergoing special training at Hamble, near Southampton, England. The well known Calcutta flying boat is being used for the practice and training flights so that, by the time that the new planes are completed, there will be competent crews to man them.

END.

**An English "Calcutta" flying boat now employed as a training ship for future trans-Atlantic pilots.**

## Capt. James V. Martin Files Suit

**Capt. James V. Martin, the noted inventor and pioneer pilot.**

THE pioneer aircraft inventor and manufacturer, Capt. James V. Martin, has filed a $9,000,000 patent infringement suit against the United Aircraft Manufacturing Corporation and its subsidiaries.

Capt. Martin claims infringement upon his patented landing gear, which he claims was invented by him in 1916. Additional suits which "will involve every aircraft manufacturing concern in the country," and which will claim damages amounting to hundreds of millions of dollars, are being prepared, according to a member of Martin's legal staff.

## This Is One Way

AS a signal of the era of reconciliation in Turkey, non-Turks of the nation are providing wings for the Turkish fatherland in a unique manner. An Armenian committee has been formed to collect subscriptions and a plane will be purchased and donated to the nation's air force as a sign of Armenian devotion to the Kemalist homeland. The Jews are another large non-Turkish community which has resolved to help air defense in the same way.

## New French Invention

FROM France comes news of two inventions to add to the safety of flight. One device permits the pilot to observe variations in altitude of one meter and more during a flight of several kilometers. The other gives a record of the temperature to one-hundredth of one degree. The last-named device is based on the principle of vertical movements of the atmosphere which are utilized by gliders.

# A Few Japanese Navy Planes

by N. MATSUMURA

**Our Japanese correspondent has sent us this very interesting group of photographs showing prominent types of planes now seeing service in Japan.**

UNTIL re-organization and enlargement were effected in 1921, the Imperial Japanese Naval Air Service had had only a small number of seaplanes.

In 1921, when the completion of its first aircraft carrier "Hosho" at The Asano Dockyard, Tsurumi, near Tokyo was nearing, the organization was greatly improved and the training on land machines was started. In this year a big airdrome was built near Lake Kasumigaura, which is the present Kasumigaura Airdrome, and a large number of aeroplanes and aero engines, including materials for construction, were ordered from England.

A group of English airmen, headed by The Master Sempill, late R.A.F., was invited here to give instructions to our young Naval flyers. The present powerful Naval Air Service stands on this foundation, and it was at this time that shipboard fighter made its first appearance in our Naval Air Service.

The Gloster Company, England, had Mr. Folland of that company design a fighter for our Navy. Three models of this type were supplied.

This is the Sparrowhawk series of fighters and our Naval flyers were taught on these planes by English airmen. Sparrowhawk-III (B.R.II 230 h.p.) was a single-seat fighter biplane and it was revealed that, as shipboard fighter, this machine had splendid performance. It was equipped with hydrovane and emergency gear.

While we adopted fighters of English design and materials, the home construction was planned and Mitsubishi Aircraft Company and other aircraft factories were organized. The Mitsubishi Company engaged Mr. Smith, late designer of the Sopwith Co., and had him build many types of military aeroplanes. A 300 h.p. Hispano Suiza motored single-seat biplane of his design passed the test of Naval Air Service and was named "Navy 10" type fighter. This type had been in use till Navy 3 type fighter substituted it.

In 1928, big plans for the improvement of shipboard fighter were considered and the competition test was held for their adoption as equipment machines. Shipboard fighters from European countries and of home designs were put to test and finally the Gloster "Gambet" fighter was adopted, the construction rights of which were immediately purchased.

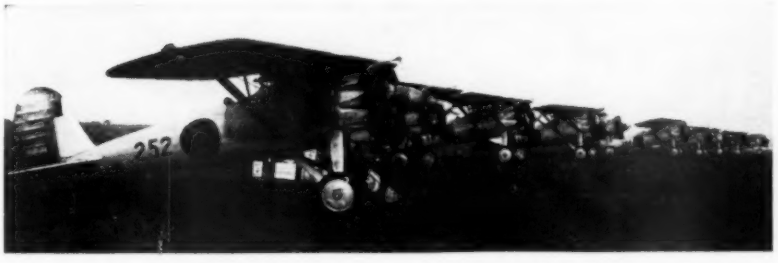
Navy 3 type was a modification of this machine, and Nakajima and other aircraft factories constructed this machine using home materials to the orders of Navy. During Shanghai disturbances in 1932, this type of machine was largely in use.

On February 22, using this machine our airmen shot down the Boeing plane, piloted by Robert Short an instructor to

**Japanese Navy "90-II" Reconnaisance 2-seater biplane.**

**The Japanese Navy "90" Type Fighter.**

**A group of Japanese shipboard "3" type fighters.**



**Japanese Army "91" type single-seat fighters.**

the Chinese Air Forces, in the first air combat in the Orient. Three Chinese planes were also shot down during the same month by our flyers on this machine.

Now we have one of these fighters exhibited in the War Museum "Yushukan" in Tokyo in memory of the great service the machine performed in the recent disturbances.

However, Navy 3 type has, at present, been out of use and Nakajima 90 type (Kotobuki II 450 h.p.) fighter with better performance took its place.

This type is a biplane of metal construction, can perform all acrobatic flights and has remarkable climbing speed. While Navy 3 type requires 7 minutes and 25 seconds for climbing 3,000 meters, Navy 90 type requires only 4 minutes and 10 seconds.

Against the maximum level speed of 237 km. p.h. of 3 type, Navy 90 type has the maximum speed of 300 km. Span 9 m. Length 6.6 m. Height 3.2. Weight loaded abt. 1,000 kgs. It is understood that some type of greater power and better performance is now considered for the substitution of Navy 90 type.

## Specifications of Japanese Planes

| Name | Sparrowhawk (Gloster) | 10 type (Mitsubishi) | 3 type (Gloster Gambet) | 90 type (Nakajima) |
|---|---|---|---|---|
| Year | 1920-3 | 1921-8 | 1928-32 | 1931- |
| Span (M) | 8.5 | 8.5 | 9.7 | 9.4 |
| Length (M) | 6.0 | 6.9 | 6.5 | 6.6 |
| Height (M) | 3.1 | 3.1 | 3.3 | 3.2 |
| Wt. Empty (Kgs) | 770 | 940 | 882 | — |
| Load (Kgs) | 150 | 340 | 493 | — |
| Total Wt. (Kgs) | 920 | 1280 | 1375 | 1000 |
| Speed Max. (Km.p.h.) | 194.5 | 213 | 236.8 | 300 |
| Climbing to 3,000 M. | 14 minutes | 10 minutes | 7 minutes | 4 minutes 10 seconds |
| Range | 2.5 Hrs. | 2.8 Hrs. | 3 Hrs. | 3 Hrs. |
| Motor | B.R. 2 | Hispano Suiza | Jupitor | Kotobuki-II |
| H.P. | 230 | 300 | 420 | 450/500 |
| Ceiling | 5200 | 7000 | 7000 | — |

## Another Aviation Cross Word Puzzle
by SIDNEY PERLMAN

YOU will find this second airplane puzzle more difficult than the first of the series, which appeared in the April issue. We don't say this to discourage you, but rather to put you on your guard against some of the unusual trick words.

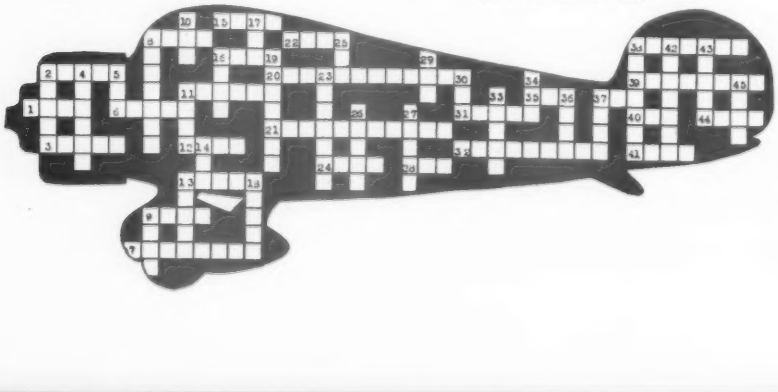
We believe that this series of puzzle pictures is proving quite popular with our readers and, just as a suggestion, it would be well for you old readers to look up the words in the Glossaries of Words, Terms and Phrases, published previous to August, 1935. They contain all but three words in the puzzle.

Just to give you a good start and to help unlock the situation, we will give you the word in 2 across. It is "chord." The correct answers to this puzzle will be found in the next issue.

ACROSS

1—Dirigible is fastened to it, after landing.
2—Width of airplane wing.
3—A fitting for attaching control surface.
6—Solid wire.
7—Method of covering wings.
8—Gas section of an airplane.
9—Main member of wing.
11—Curvature of the wing.
12—Maneuver where plane turns completely over.
13—To ascend.
15—That which causes a plane to rise.
16—Put over wheel for streamline.
20—Airplane with flapping wings.
21—Science of aerial navigation.
22—Nat. Advi. Com. for Aero (Abbr.)
24—Maneuver in which plane revolves.
28—Pilot's term for throttle.
31—A non-rigid airship.
32—Manner of generating electric current.
35—Aerial Experiment Association.
37—A short flight.

(*Concluded on page* 467)



## Flea is Now in Production

**Looks like a toy factory. Here they are, sticking a Flea together on the production line. Shades of Henry Ford!**

FOR a long time, our impatient readers have been sitting on a hot seat, waiting for the news of the Flying Flea as an immediate production possibility. For months they have been besieging us for the good news and now it has arrived.

Yes. The Flying Flea is now in production—but not in the U.S.A. They've got her on the production line in Merry England, let the chips fall where they may.

"Within a stone's throw of Grays Inn Road, London," to quote our English correspondent, both literally and figuratively, "an enterprising firm are making aeroplanes in Brownlow Mews. This firm was formerly engaged in making packing cases."

This company, seeking respite from the complexities of packing-boxes is, literally, stacking up another crate. This affords, no doubt, mental relaxation and other psychological reactions that are quite acceptable to the personnel. While they are turning them out at the rate of two each week, they cannot fill all of the orders that come pouring in from their patrons, both at home and abroad.

The planes sell at approximately $875.00 which is considerably higher than Mr. Vidal's estimate for the ideal family sky-cart. We thought it would get up to about $1000 when they finally got down to work on the job.

## Crippled but Flies

GENERALLY credited with being one of the most brilliant flyers in Europe, Major Bancoilescu of Rumania has not let the fact that he lost both legs in a plane crash nine years ago deter him from continuing his career. Major Bancoilescu operates an airplane's foot controls with artificial legs. He attended the International Aviation Federation's meeting in Washington last fall, and pronounced the United States far ahead of other nations of the world in both commercial and private aviation.

# "....Clear and Unlimited"

by SWANEE TAYLOR

**And here is the opening gun fired by Mr. Taylor in his series of highly interesting and valuable commentaries upon the personnel and material of aviation and its derivatives. The livest and most pertinent column in aviation.**

*An Open Letter to F. D. R.*

Dear Mr. President:—It is pretty well known that during the past three years you have heard about every kind of hard-luck yarn imaginable.

And, judging by the newspapers, they have scaled all the way from very desperate letters beseeching presidential aid in chronic mortgage matters, down to sundry tear-jerking $10 touches to get little Sadie Plushbottom (out in Rowboat, Ia.), a gingham dress and some new store teeth for grandpaw. Well, I've been thinking lately that it's about time someone wrote you along cheerier lines. Which is what I'm about to do.

First-off, Mr. President, I'm working steady again and everything's going to be all right! Then, without further enlargement on this gladsome news, permit me to launch right into a report on the state of the Aviation Industry in these United States:

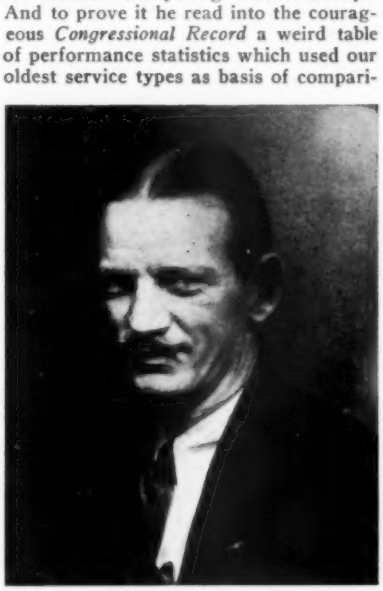
On the whole, I'd say that the business is in reasonably good shape. The physical set-up is splendid and our personal side is excellent indeed. All we need now is to make some money. And this we can do, Mr. President, if you will play on our side for a couple of innings. It will be easy as apple-pie, honest it will.

You see, the world today is eager to fly. There's a new generation on tap who are all for aviation, with the war babies coming up stronger and stronger all the time. And these young people have a most peculiar insistence ringing in their demand for ample adequate aircraft which augurs ill for any of us old phoofs who stand dodderingly in their way.

Lordy, they'll tromp all over us, then hoot us clean off history's page if we do. What's more, if we don't meet their fresh eagerness with the balm of our own experience there'll be an awful lot of fine young bodies strewn over the countryside, bent and doubled in sudden death. That, Mr. President, will be our fault. Let's do something to make their courses less turbulent.

A word from you will do the trick. S'help me, it's as simple as that. The only thing need be done is for you to call off the Congressional Canines (colloquially spoken, Honored Sir); make those congressmen, down there, stop yapping at the heels of my Beloved Industry. The reason I ask this is because it looks like "the boys," as they are amusingly called, still persist in thinking that you are somehow mad at us. Of course there is no foundation for this silly belief, never was. Which only goes to show that Allah himself can't predict which way a congressman is going to think. Anyhow, tell them, please, to turn off the hate and read up a little on what goes on in American Aviation.

To illustrate my meaning let me point out how Representative McFarlane, Dem., Texas of course, smeared us for a severe financial loss. He comes from my home State so I feel I can speak freely, if not critically. Well, without knowing what in heck he was talking about, the gent from Texas stood up on the floor of the lower House and stated that American airplanes and engines were far inferior to anything built in Europe. And to prove it he read into the courageous *Congressional Record* a weird table of performance statistics which used our oldest service types as basis of comparison with the latest thing in foreign aircraft development.



**And here is Swanee Taylor, a welcome addition to P.A.'s growing staff. Swanee is one of America's prominent characters of the air besides being the leading air race commentor.**

Just who it was that gave him this garbled chart, and why, doesn't matter now. What's more to the point, when that particular issue of the *Record* got out and around our exports did a sharp and lasting power-dive. In one instance, an alert young Britisher, ironically enough, used our own *Congressional Record*, to eliminate us in South America. In short, Mr. President, Representative McFarlane leads with Uncle Sam's chin, and the English aircraft manufacturers now have the Latin-American market comfortably to themselves.

Another result, painful for sure, of legislative meddling takes shape in the Vinson Bill which limits all profits on sales to the Navy to a carefully audited ten per centum. Oh, ten percent. is reasonable enough, I suppose, when one is dealing in hogs, lumber or yard goods. But it will never in this world afford an aircraft manufacturer the slight margin necessary to throw back in for experimentation and future development.

You have plenty of astute young men gathered about you, Mr. President, who will substantiate this point of elementary economics. Hence, I'm going to skip over that phase of it. What I'm concerned about, and I'm sure you will share that concern, is what's to become of the rich engineering heritage due our successors if technical advancement is stifled now. (Already the above mentioned Mr. McFarlane has proposed still another cut in profits, down to 10%, on the Army Appropriation Bill.)

What's to be done about the 12,000,000 model builders, a startling number of whom are more interested in airplane design than in flying?

This now-descending problem takes on a distinct seriousness because we are a mechanical nation; inventiveness is our native flair and aviation is a peculiarly American attribute. At the risk of disastrous political consequences neither should be throttled nor encumbered by butter-finger politicians. If Democracy or Republicanism won't take these youngsters seriously—who are smarter at twenty than our pappys were at forty—then another creed will get them.

Aviation is in a splendid position to absorb these young people and put them on a God-fearing, patriotic track of thought. We have conquered gravity, Mr. President, and we've got time pretty much on the run. So it is reasonable to believe that we can handle a sour-puss red menace. But . . . we've got to be let alone.

Won't you, therefore, please pass the word along to sheathe the daggers, and you yourself keep a friendly lookout for signs of evil-doing? If you will you can rest assured that we'll see to it that no Republican selfseekers make a political football out of our Beloved Aviation. And, what's more, we'll love you again the same delirious way we did that happy day when you climbed in the ship at Albany and headed for Chicago.

I am, sir, respectfully,

Your Obedient Servant.

* * *

*And Now a Memo to the Industry*

Mainly to call your attention, merry gentlemen, that ". . Clear and Unlimited" has been instituted to serve Aeronautics in any way that a good loud holler can be of service. And every blessed one of you can count on it that your devoted correspondent will be at your side a-hollering whenever the need arises. Be you right or wrong, he'll be there hollering for justice or for mercy as the case may be.

Speaking for the magazine, I'd like to

reiterate that our editorial policy is just what the name indicates—we strive to further popularize aviation. We feel that someone owes a duty to a public who cares enough about flying to keep informed on the subject. We've saddled ourselves with that pleasant duty, and to those swell people we've pledged our eternal loyalty.

But, dear dear Industry, don't you forget for a moment that these same people make up the potential market for your wares, be they airplanes, gasoline, rubber tires, instruction, rides or any of the numerous accessories. And while you are about the business of not forgetting, conjur up in your mind a picture of what yesterday's student was doing four years ago. Chances are that he was mid-way through school. Which makes it easy to imagine that within another four years he will be buying an airplane. Think about it some.

After you've pondered for a few moments you'll appreciate the great work being done by Larry Shaw and his Junior Birdmen of America. So successful is this youth movement that imitations of it are springing up everywhere, including Communistic circles. (The New York nest has organized a Jimmy Collins Squadron and plan to go out to the airport as soon as somebody digs up subway fare.)

I have made a careful study of the Jr. Birdmen of A., and find that they have a sane and sensible program of activities now busily in progress for nearly half a million high school boys. These kids are taking part in four contests each calendar year. But what's even better, I can see quite clearly how in a year or so Larry Shaw will dump a hundred thousand white-hot air enthusiasts in our laps. That means business, maties, business!

I get so stirred at the thought of it that I tip my hat to Larry Shaw from where I sit. And then I tip it again to Wm. Randolph Hearst who was the only one who would lend a friendly ear when Shaw was trying so hard to launch his idea.

* * *

*Goodbye Roosevelt!*

By the time this sees the light of day, the original Roosevelt Field will have given up the ghost in the face of the relentless march of recovery. All that's left is the little step-brother, Hazelhurst-Curtiss-Roosevelt No. 2.

Yep, as you probably know, the "upper" field, the most celebrated flying field in the world, has been turned into an automobile race track. Oh well, it was their field and they certainly are privileged to do with it whatever they want. Thus passes one of the finest "Natural" fields in the world—and just as we were beginning to need it terribly.

Maybe, in the distant future the spirits of such stout fellows as Bert Acosta, Brent Balchen, Dick Byrd, Harry Rogers, Wiley Post, Casey Jones and other old-timers, who knew the place and loved it will gather there o' nights in the dark of the moon and raise spooky hell. One thing, I know whom I'll haunt.

END.

# The Importance of Attack Aviation

by HERMAN R. BOLLIN

(See Front Cover)

**A group of Northrop Attack planes, Type A1-U, strafing a truck organization on the highway, a typical mission of the attack planes. Note that the striping and insignia show that these planes belong to the 13th Attack Squadron of the 3rd Attack Group. This is the tentative striping of all 3rd Attack Group planes.**

ATTACK aviation is the employment of airplanes for punishing land troops and the ground base of the enemy air forces, by specially constructed planes armed with machine guns, light bombs and chemicals. In the same way, it can be used to attack enemy forces on water.

Under all wartime conditions, there are situations on the ground that are out of the reach of ordinary ground arms, but which can be dealt with very effectively by attack aviation when the opportunity definitely presents itself. However, it is not the purpose of attack aviation to search out and engage enemy forces indiscriminately without definite data before takeoff.

Primarily, attack aviation depends for its success upon the surprise and shock elements, because the attack must be completed before protective measures can be taken by the enemy. The surprise is effected by the speed of the planes, the direction of their approach and by the planes taking cover wherever possible until close to their objective. Concealment behind hills, thick woods and other elements of the terrain can usually be maintained until a few seconds before the blow is launched.

Attack planes, in the fulfillment of their mission, usually fly very close to the ground at high speed, usually not more than ten to 15 feet above the surface of the ground. Low-flying is not only an important factor in the surprise element of the attack, but low flying is also a protective measure for the attack planes against anti-aircraft fire and enemy pursuit ships. When so close to the ground, it is almost impossible for the land troops to handle their weapons rapidly enough to harm a high speed low flying plane.

High speed in an attack plane is of the greatest importance because it increases the effectiveness of the surprise element and shortens the time of exposure to enemy air and ground fire. While the single-seater attack plane is faster and more maneuverable than a two-seater, the lack of defense from the rear makes it vulnerable to attack from hostile pursuit, the latter nearly always having the advantage of altitude. In order to fight, the single-seater attack plane must turn around, and this again puts it at a great disadvantage when coping with a fast maneuverable pursuit plane. Its depth of penetration into enemy country is limited by the small amount of fuel carried.

Still another count against the single-seat type of attack plane is the fact that it must drop its load of bombs when attacked in order to gain sufficient climb and maneuverability for fighting off its adversary.

But, the two-seater plane, if designed for attack work, should still be able to maintain high speed and maneuverability and in formation will be able to continue on its mission during attack due to the fire from its rear guns. It will not be necessary for the two-seater to drop its bombs when attacked as it can fight without turning around.

Speed range is of great importance for it enables the pilot to regain his position in a formation, should he for any reason be forced out of it, and it also shortens the time of breaking up into smaller units. The observer and pilot must have the greatest possible range of vision with a minimum of "blind space" ahead so that the target or hostile attack can be clearly seen at all times.

But, fundamentally, the attack plane's purpose is to make life easy for the pursuit ships and bombers by subduing hostile land forces. Its particular objectives are enemy hangars, fields, balloon ground crews, anti-aircraft batteries and so forth. With these obstacles removed, our bombers, photo planes and observation ships can proceed with their functions undisturbed by ground attack or archie bursts.

# Ford and the Lightplane

by VIRGIL E. LaMARRE

**Once upon a time, as the author points out, Henry Ford of auto fame was much interested in lightplanes and did much experimental work. It is rumored that he is again interested—but time will tell.**

SHROUDED with secrecy reminiscent of earlier experiments with the original Ford "flivver" in 1928, the Aircraft Section of the Ford Motor Company is again experimenting with a light airplane suitable for private use.

And thus, a new significance is attached to Henry Ford's declaration, made December 14th, 1928, when he definitely abandoned initial experiments with a light airplane.

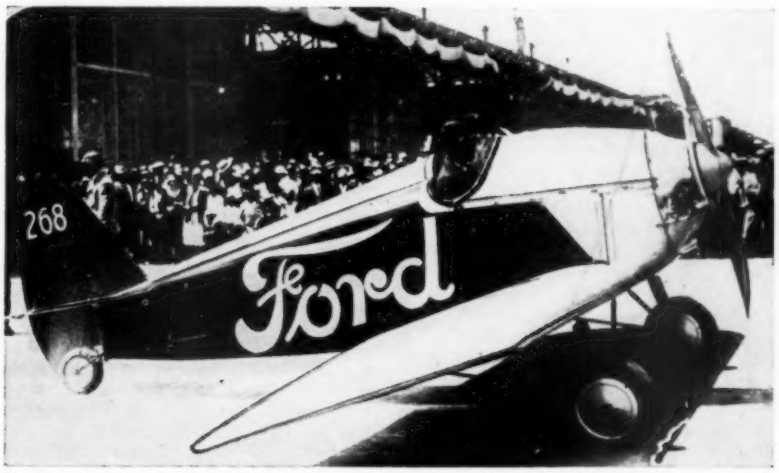
"It will be necessary to develop an engine of high performance and very light weight before lightplanes will become practical," he then stated. "The 'flivver' plane will become a reality when the public is sufficiently 'airminded' to insure its success."

Ending a four-year period of aeronautical inactivity—the last tri-motor was constructed in 1931—an experimental license was granted the Ford Motor Company December 17th, 1935, which date incidentally marked the thirty-second anniversary of the Wright brothers' first flight at Kitty Hawk.

Does this fact mean that Henry and Edsel Ford are at last convinced that public airmindedness is sufficiently aroused to warrant the construction in wholesale lots of a safe, inexpensive, light plane? Certainly Mr. Ford has a fine, dependable motor, already proven to be practicable for aircraft use, in his standard V-8 automobile engine.

Aviation experts around Detroit are standing pat. "There's no telling what Henry has up his sleeve," one well-known designer remarked. "All any of us know is that he applied for an experimental license."

Rumor has it that only one outsider—a Bureau of Air Commerce inspector—has actually seen the new Ford plane.




**Here is the original Ford "flivver" plane built in 1928, with Harry Brooks, Ford chief test pilot, seated in the cockpit. There is something about the fuselage curves that suggests the old "Tin-Goose."**

And he isn't talking. Mr. W. J. Cameron, public relations director for the Ford Motor Company, answers all questions regarding the new plane with a laconic shrug of his shoulders.

"I don't know any more about it than you do," he replies, meaning: "It's none of your business—yet."

A lot of sleuthing, however, has gleaned us the following information, which we in turn pass on to the readers of POPULAR AVIATION. We won't vouch that all of it is entirely accurate, but we assure you it's the very best available. So here goes:

According to information filed with the Bureau of Air Commerce, the new Ford plane, known as Ford Model 15-P, is a two-place cabin monoplane, equipped with dual-controls and powered by an improved type standard automobile engine, bearing serial No. 3, and developing 115 h.p. at 3600 r.p.m's. The conventional V-8 engine develops 90 h.p. at 3600 r.p.m's.

It is equipped with two gas tanks each holding 15 gallons, giving the craft a cruising radius of 500 miles. The oil tank holds one and one-half gallons.

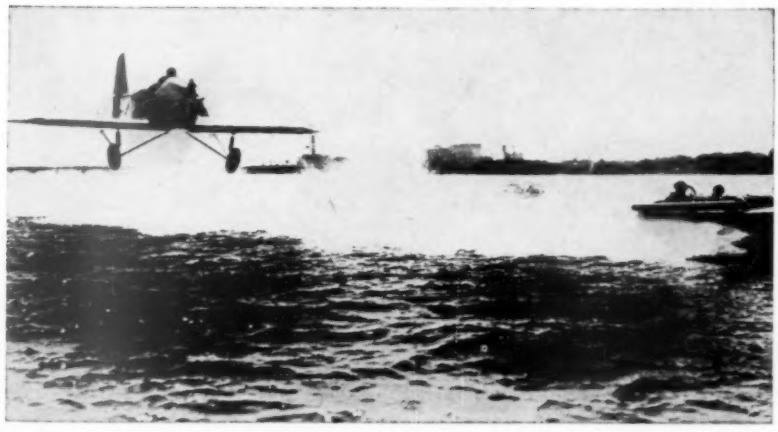
In addition, information on file at the Bureau reveals that the ship is equipped with a Gardner wooden propeller and that it was constructed in November, 1935, a month before an experimental license was applied for.

Of historical significance, dating back to the early days of the automobile, is the identification number assigned to the craft by the Bureau of Air Commerce, at the request of the Ford Company. That number, made famous in 1903 by Barney Oldfield in Henry Ford's early record-breaking car, the "999," is "X-999-E."

License for what it terms "an experimental airplane and engine development," expires June 1st, 1936.

Now that we've given you all the factual information regarding the Ford Company's newest brain-child, let's lend an ear to what the hangar-pilots, designers and "those in the know" have to say about the most widely discussed and least known airplane yet created.

"We've got all the blueprints and performance specifications on this job up in our laboratories," one informant, a designer for a big automobile plant in-



**Harry Brooks, in the original Ford Flivver, racing a Gar Wood speed-boat in the Detroit River.**

XUM

formed us. All ears, like a well-known movie heart-breaker, we inquired,

"What's it look like?"

"Huh! Think I want to lose my job?" demanded my unwilling informant.

"Well," (sneeringly) "your story sounds fishy." (egging him on).

"Listen!" (belligerently) "I know what that plane looks like!" A derisive silence. Then,

"It's a pusher, isn't it?"

"Yes."

"Then it must resemble a cross between the Campbell and Hammond beetles, (the latter is described later on in this article) and Bill Stout's 'Sky Car?'"

"You're getting hot."

And there, readers, the inquisition ended with my subject stalking off, muttering dark curses in his beard about "snoopy friends."

Other informants, equally unreliable, swear the ship has the motor located in the nose, a long drive shaft carrying the power to the propeller located at the rear of the cabin.

However, while we're about it we may as well have a look at the early Ford "flivver," just to get an idea of the trend early Ford thought followed along this subject.

Making its initial appearance early in 1928, its debut was a complete surprise even to some airport officials at Dearborn. Designed by Otto Kappen, 26-year-old German engineer then employed by Ford, the plane was constructed behind locked doors by three trusted employees. Its development was followed with great interest by Henry and Edsel Ford.

"I like the small planes," the former declared, "I think people are more interested in them, too."

The original Ford "flivver" was a low-wing ship of semi-cantilever, wood and steel construction. It had a wing span of twenty-five feet and an overall length of fifteen, and was powered first with a three-cylinder 36 h.p. Anzani engine of the air-cooled variety, and later with a two-cylinder, opposed type air-cooled engine likewise developing 36 h.p. This last engine was of Ford design and construction.

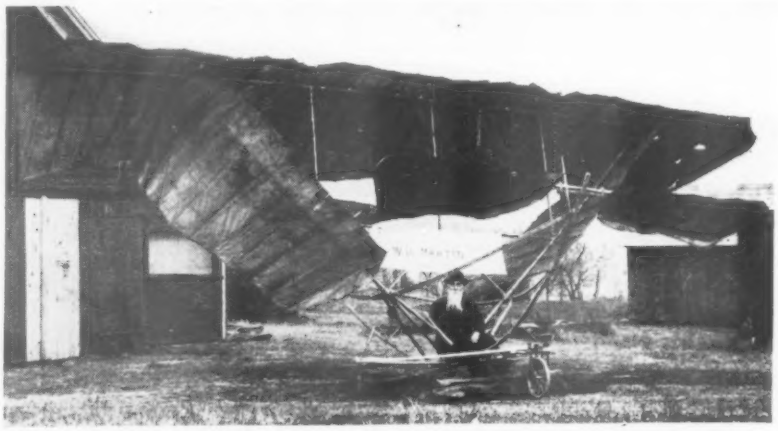
Flown by Harry Brooks, Ford's 26-year-old chief test pilot, the original "flivver" created a mild sensation in the aeronautical world. As a single-place job this little plane exhibited some very advanced flying characteristics for its day. Landing at 30 miles an hour, it had a high speed in excess of 85 and a cruising radius well over five-hundred miles. In fact, Brooks established a record for planes of this category when he flew, non-stop, from Detroit to Ashville, North Carolina, where he was forced down by ice.

A tragic climax to Ford's initial experiments with the "flivver" occurred a short time later. Enroute from Detroit to Ford's winter home in Florida, Harry Brooks was observed flying at a low altitude over Titusville, Florida. His motor appeared to be missing, several witnesses later testified.

Suddenly, the tiny craft headed out to

(*Continued on page* 454)

## Wonder if Bellanca Ever Saw This?



**W. H. Martin, aviation pioneer of Canton, Ohio, is seen sitting in his monoplane that dates 'way back when. Note the similarity to the Bellanca wing construction.**

BACK in 1909 or 1910, we're not sure which year to credit with this invention, W. H. Martin, Canton, Ohio, completed the construction of this original monoplane. Prior to the construction of this ship, Mr. Martin had been experimenting with models for many years.

Probably the most remarkable feature of this old plane is the similarity of the inclined lifting surfaces that are very similar to those of the modern Bellanca, at least in appearance if not in fact. Martin's idea was to obtain stability without the use of dihedral and to obtain the strength of a biplane structure with the monoplane wing. He had repeatedly demonstrated the feasibility of this idea with his models.

And, most interesting, is the variable pitch propeller which brings the old machine right up to date or else brings the present versions back about 25 years. Like machines of that period, this machine is of the canard type with the double elevator in front of and about midway of the main wing, and most remarkable is the stick control.

## Wind-Tunnel Completed at Parks College

A VERY important addition has been made at Parks Air College in the way of a new wind-tunnel for assisting the engineering students in the design of airplanes and airplane components.

This new wind-tunnel is an open-throat return-flue type built from the designs of the National Advisory Committee for Aeronautics. It has an open-throat diameter of 30-inches which will be of sufficient size for accurate experimental work and for demonstrating the various laws of aerodynamics. Demonstrations by an actual standard tunnel impress the student more deeply than many books.

**The new wind-tunnel at Parks Air College comprises the latest developments in wind-tunnel design and forms a useful part of the school aerodynamic laboratory.**

# Flying the Hump is a Hazard

by T. R. WISEMAN

**A story of the difficulties encountered in flying over the Divide and the surrounding mountainous and rocky regions. Every conceivable difficulty is experienced in mounting over these highlands.**

DO you ever lie awake nights, "flying the course" of a trip planned for the next day?

Years ago, I used to lie for hours, going over a mountain trip planned for the next morning. But those days have been swept away on the prop-blast of hundreds of mountain trips.

With a practical knowledge of mountain air currents and high altitude flying, and given a ship which flies at a sufficiently high ceiling, mountain flying should be as easy as flying along either coast.

I had a pointed demonstration of the absolute necessity for close fuel calculations as well as the need for a ship with plenty of altitude on a trip over the range from Denver to Montrose, a short time ago.

After leaving Denver, up near the top of the Divide, I flew through clouds as white as the snow on the peaks. I had a prevailing west wind and found it best to fly at about fifteen thousand feet to get above those clouds. The mountain peaks are bare and rocky in this district because they are above the timberline. Most of the time white cloud patches against the green and black hills were hard to tell from snow.

On the east side of the Divide I drew a nice up-current which pushed along behind the tail of my ship and helped tremendously. I made good time for the first half hour. Once over the top, a west wind jumped on the nose of my ship and from then on I had a steady fight all the way to Montrose. I knew I'd have to try to slip down into the Gunnison Valley through one of the passes. This was no easy problem to solve but there were others.

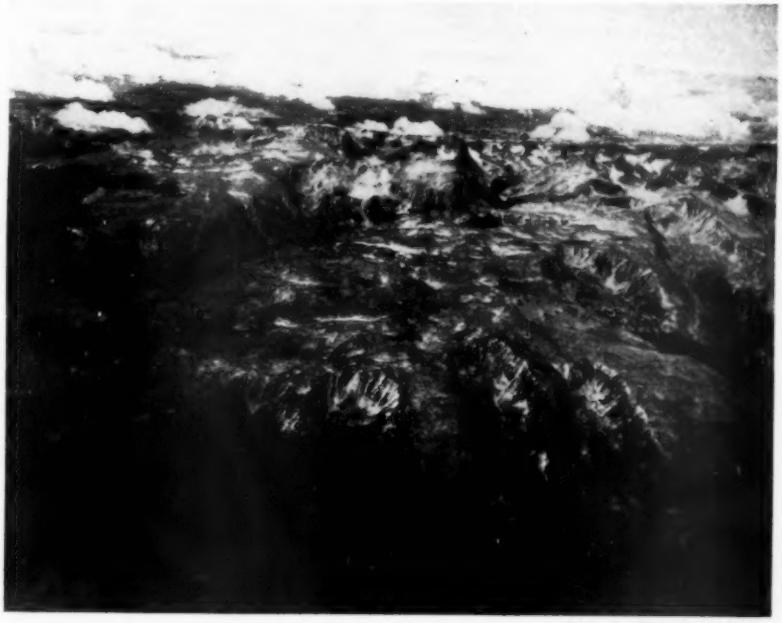


*Photo by King Aerial Survey*

**When flying over the "Hump," above the clouds, it is difficult to tell the difference between the snow and the clouds.**

Monarch and Marshall Passes came first, fairly close together,—after that I'd have one more chance—at Poncho Pass. If I could find them and get down that way, I'd lose that devil of a wind for a while and save both fuel and time. But try to find those Passes!

Both Monarch and Marshall were completely hidden by clouds. Altho I had a fair idea from my course and a map of where they ought to be—it didn't do me any good. You don't go diving through mountain passes around here, unless you can see them—not if you're sane. I couldn't spare fuel to circle around and hunt for a way down thru these canyon valleys, so I went on to Poncho Pass.

At Poncho Pass I found a hole in the cloud floor and dived through into the Gunnison Valley. I'd been out from Denver about two and a half hours and had only made a distance of a hundred and fifteen miles. I couldn't tell—even yet—whether there was snow or clouds below on the ground, so decided to go on.

My enemy the west wind was still waiting there, to meet me when the ship circled out of the Pass. I had fifty miles

*Photo by King Aerial Survey*

**Another tough stretch of country with good hard rocks and masses of sharp pointed pine trees. Certainly not an ideal landing field for the novice—or anyone.**

to go down the Gunnison Valley and forty minutes fuel. That's running pretty fine—when you're fighting a wind.

At Sapinero I was only pushing seventy miles an hour behind me, due to bucking the same wind. The snow on the ground looked deep. I was afraid to land for gas for fear I'd not be able to get in the air again, so I pushed on down thru the plains region with still twenty miles to fly. Skimming through the hills, I had only about ten minutes fuel and I couldn't even see Montrose.

The ship hung right over town before I realized it. Just as I sighted the town lights, beginning to twinkle in the hazy dusk of a mountain night, I heard a sput-sputter. Out of gas!

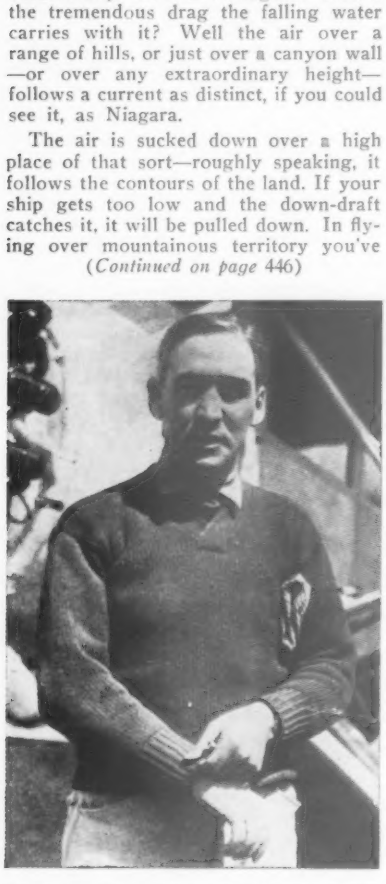
I pulled the nose down and skidded into the field plenty quick on a half circle glide. They had to pull me over to the fuel supply, but I managed to slide most of the way up the field on momentum. That's flying with your wings tied close!

This extra circling we get in mountain flying takes lots of fuel. Gasoline is worth more than an extra pair of wings, when towns are far apart and landing places all grow eighty foot pines and granite head-stones.

Down-drafts are the treacherous claws which pull a plane from the sky. Even an experienced pilot gets caught in one, occasionally. Ever see Niagara? Notice the tremendous drag the falling water carries with it? Well the air over a range of hills, or just over a canyon wall —or over any extraordinary height— follows a current as distinct, if you could see it, as Niagara.

The air is sucked down over a high place of that sort—roughly speaking, it follows the contours of the land. If your ship gets too low and the down-draft catches it, it will be pulled down. In flying over mountainous territory you've

(*Continued on page* 446)



**Lieut. Colonel Carlos L. Reavis, an experienced cross-mountain flyer.**

## Rah-Rah-Rah- Curtiss Class of 1912

**The 1912 Curtiss graduates. Left to right: F. Barlow, J. G. Kaminski, W. M. Smith, W. A. Davis, R. B. Russell, Mohan Singh, J. Lansing Callan, Julia Clark, M. Dunlap and K. Takeishi of Japan.**

MUCH water has passed under the bridge, and many classes have been graduated since the accompanying photo was taken, but we are willing to place a bet that none of them have proved to be any more enthusiastic or competent.

This picture was taken in San Diego, Calif., in 1912, at a time when such commencement exercises were front page news. The general public was then not quite certain whether this group were heroes representative of a new era—or just plain nuts. And when you take in the old tripod training plane at the rear of the group—forming the background as it were—we believe that you will not be so very certain on this point.

In this group are Mohan Singh, the first Hindu pilot, M. Takeishi of Japan, one of the first three Japanese flyers, and Julia Clark, who was years ahead of the 99'ers.

## The Percentage of Lightplanes Increases

AN increase of approximately 34-percent in the number of light airplanes of the private owner type manufactured in the United States in 1935 is shown in air-craft production figures for that year.

The total of all aircraft produced continues the upward trend which commenced in 1934. Previous to that year production totals were on a marked downward path, sinking from 6,193 in 1929 to 1,324 in 1933. The total for 1934 rose to 1,615 and in 1935 it was 1,691.

The increase is particularly noticeable in small civilian airplanes of the types suitable for private owners. The greatest increase in this classification occurred in the number of one and two-place cabin land monoplanes produced. In 1934 there were 120 manufactured while 460 were constructed in 1935. The number of three-place cabin land monoplanes increased from 54 in 1934 to 83 in 1935.

Of the total production in 1935, 1,079 aircraft were for domestic civil use, 317 were for delivery to military establishments, and 295 were exported.

The industry produced 908 monoplanes and 171 biplanes. The 908 monoplanes included 176 of the open cockpit type and 732 cabin craft. Of the biplanes 42 were open cockpit and 129 were cabin planes.

Further information obtained by the Bureau of Air Commerce concerning the 1,079 aircraft manufactured for domestic civil use shows that there were 137 companies or individuals producing airplanes for domestic civil use during this period. Of course, 6 companies manufactured 50 or more planes each or approximately 63 percent of the total for domestic civil use; 10 companies built 9 to 43 planes each including parts for 11 planes by one firm and parts for 14 planes by another; 10 firms constructed 3 to 7 planes each; 8 companies, 2 planes each; and 17 established manufacturers produced one plane each, as did 86 other firms and individuals. These 86 represent approximately 8 percent of the total production for 1935.

Of special interest is the record of some of the individual companies. One, in particular, a lightplane manufacturer, increased his production from 73 in 1934 to 227 in 1935. Another in the same class increased production from 60 aircraft in 1934 to 118 in 1935, while still another showed an increase of from 5 in 1934 to 56 in 1935. A fourth's production jumped from 4 to 43.

# Death Lurks Ever at the Pylons

by GEORGE E. PELLETIER

**Airplane racing takes its toll of victims yearly, and for what? The author analyzes the air-race situation according to his lights, which are not exactly in accord with our views, but close enough so far as the essential facts are concerned.**

DOUGLAS DAVIS of Atlanta, Ga., just plain "Doug" to all who knew and loved him, sat on the running board of a field-car at the National Air Races at Cleveland, collecting autographs of friends and celebrities on the brim of an old straw hat.

It was a half hour before the start of the Thompson Trophy race, the fastest landplane speed event in the world, which carries $10,000 in prize money for 25 minutes of competition. I sat with him awhile, and Doug felt good as he discussed the prospects of the race.

Everything seemed to be in his favor. He was to fly the late Jimmy Wedell's black and red monoplane, "44" as the flying world knew it—the same ship in which Jimmy had set a world's landplane speed record of 304.98 miles an hour at Chicago late in 1933.

Overnight, Doug had changed the engine on the "44," giving it 150 more horsepower and more miles per hour. That very morning, he had himself flown it over the measured three-kilometer course at an average pace of 306 miles an hour—burning over the area between the checkered pylons faster than any human had ever gone in a landplane before, although not sufficiently in excess of the old mark to constitute a new official record.

Behind him was the record of having won the first Thompson Trophy race, in 1929, and the silver trophy that went with it at the time. That was a year before the present permanent trophy was established. And only three days before, he had flung "44" through thunderstorms and hail from Burbank, Calif., to Cleveland to flash by the judges' stand the winner of the Bendix transcontinental race, and the $4500 first prize money that went with first place.

No wonder Doug felt good as he passed around a borrowed fountain pen from one friend to another. Certain triumph in the Thompson seemed ahead, as well as the unique honor of having twice won the Thompson race, and both the Bendix and the Thompson in the same year. Never had this been done. Jimmy Doolittle had won the Bendix in 1931 and the Thompson in 1932, and Col. Roscoe Turner won the Bendix in 1933 and the Thompson in 1934. But never had anyone done both.

It looked good for Doug—and the next hour would tell.

The next hour did tell—but what it told was not the vision that permeated Doug's mind as his old straw hat went the rounds and the navy squadron roared overhead in its bizarre "razzle dazzle" formation.

In the next hour, Doug was dead.

The fine fresh spirit which had made him so popular with the flying fraternity and the splendid skill which had made him so many times the victor, both were crushed in the mangled body they pulled from the wreckage of the world's fastest landplane, sunk in a mudhole on the backstretch of the eight-and-one-third mile course over which the race was flown.

Somebody remembered that "Doug," speaking over the public address system about his difficulties in the Bendix race, had said prophetically that he

**Farewell! Doug Davis starting on his flight to the Cleveland races where he met his death.**

"would never fly the race again." Others recalled that Davis had protested the "shortness" of the Thompson trophy course, reduced last year from 10 miles to eight-and-a-third.

The announcers cheerfully reassured the crowd of more than 150,000 that Davis had "bailed out at 175 feet" and probably wasn't seriously hurt, but the boys in the press box knew otherwise. So did the judges.

Davis had joined the company of other winners of the Thompson trophy race, which death, swifter than humans and steadier than the frail craft in which they defy fate, had claimed.

He had joined the chunky Charles "Speed" Holman, the 1930 winner who crashed to his death at Omaha on Memorial day of the next year; diminutive Lowell R. Bayles, who had raised Holman's average speed by 35 miles an hour in 1931 and died at Detroit a few months later trying to wrest the world's landplane speed crown from France, which had held it since 1924; and Jimmy Wedell, the 1933 winner whom a routine instruction flight in Louisiana laid low in July.

What happened to Davis will never be known accurately. E. W. "Pop" Cleveland, who was not far from me in the stands at the time but who happened to be watching the backstretch, was one of the few trained witnesses to the accident. Lee Gehlbach, himself an experienced speed pilot, and a competitor in three Bendix and two Thompson races, was another. They both agreed that Davis pulled up suddenly after passing the second pylon, fell off into a spin, recovered an altitude of possibly 150 or 200 feet, and then dived sharply behind a clump of trees out of sight.

"Doug didn't have a chance," they both reported.

Later, other witnesses and observers virtually reached agreement on the point as Davis shot the fast plane into a strenuous maneuver, evidently to recircle a pylon he had missed.

The signs pointed to the danger signals of air racing which had been noted before—too many pylons and too little strength. Too many turns, too much strain on both human and machine!

In many respects the accident was a duplication of the Thompson Trophy crash of 1930 at Chicago, which cost Capt. Arthur H. Page of the Marine corps, and winner of the Curtiss Marine trophy of that year, his life. Page, at the head of the field and well on his way to triumph, as Davis was, fell to death before 100,000 horrified spectators, including his wife, in the 17th lap of the 1930 race.

Witnesses agreed that structural failure was the cause of the accident, and service flyers have never competed in the classic since.

Late in 1933, Roy Liggett and Florence Klingensmith died at Chicago racing events under virtually the same circumstances—and that is what gave point to the safety suggestions made by racing pilots after Davis's death.

Liggett's plane lost a wing in the air, the day after he had taken second-place in a 50-mile free-for-all race for ships of 550 cubic-inch displacement and he was dashed to sudden and violent death at the International Air Races at Chicago.

Two days later, at the same field, Miss Klingensmith, who held the world's record for women for continuous loops and who was the 1932 winner of the Amelia Earhart trophy, met her death. Her plane, unable to withstand the terrific speed maintained by her

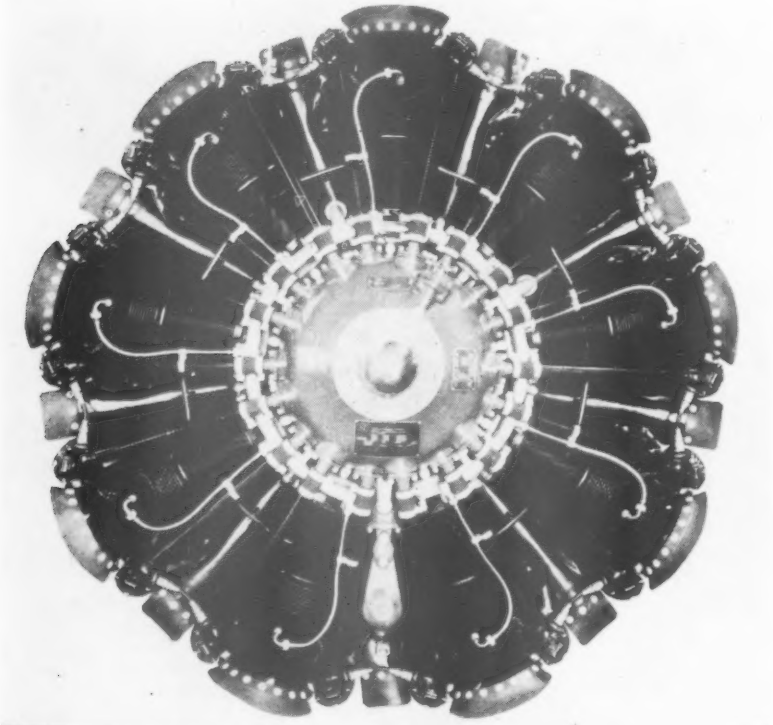
(*Continued on page* 458)

XUM

# The Wright Cyclone "G" Engine

by ROBERT McLARREN

**This 1,000 horsepower Cyclone engine is the largest commercial production aviation engine in the world, and is intended, primarily, for the new Boeing and Douglas bombers. Recently, the U. S. Army Air Corps ordered 432 of these engines at a total cost of $3,132,000, the largest peace-time order ever placed for aviation engines.**



**Front elevation of the Wright Cyclone Model "G" 1,000 horsepower engine. This is, by a considerable margin, the largest aviation engine in the world.**

ANOTHER milestone marks aviation's progress along the well worn paths of history.

A 1,000 horsepower radial air-cooled engine has appeared. Secret details of the sensational Wright Cyclone "G" were disclosed recently by the Wright Aeronautical Corporation, Paterson, New Jersey. This long awaited achievement is the product of ten years of unceasing effort on the part of the pioneering Wright company and marks a tremendous step from the original 200 horsepower Wright Whirlwind engine.

The engine was developed in the experimental division of the company, the largest air-cooled aircraft engine plant in the entire world, primarily for the U. S. Army Air Corps for use in their huge new Boeing and Douglas bombers. Both of these "flying arsenals" were designed for 1,000 horsepower engines should they become available in the process of construction.

The Cyclone SGR-1820-G, as it is technically known, was made possible by the use of a score of amazing new developments in engine manufacture. The engine consists of more than 4,000 parts made by 1,000 machines and passes through more than 36,500 machine operations in the process of construction.

The 1,000 horsepower is developed by nine air-cooled cylinders with the astounding total cooling fin area of 1,980 square inches, almost twice that of the preceding "F" model. This increase was made possible by closer spacing and the use of fins 1½ inches deep. This results in an extremely efficient cooling system which makes overheating almost an impossibility.

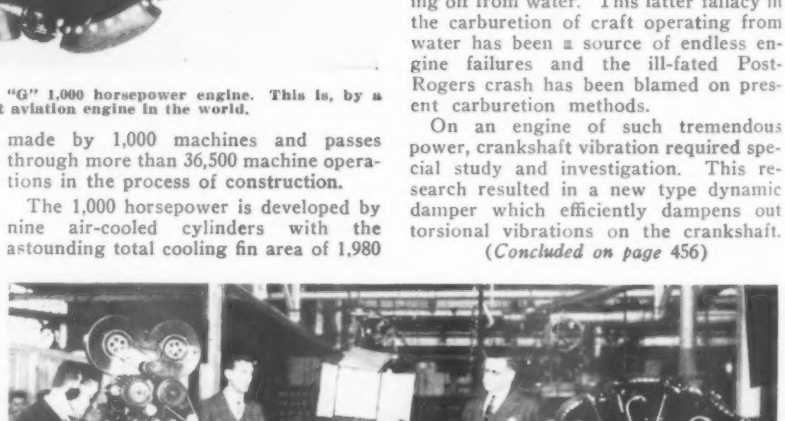
A new type supercharger has been developed which employs a 10-inch impeller. The supercharger is gear driven on the interior of the engine and sucks in a mixture of gasoline and air to produce the tremendous power needed at high altitudes.

The nitrided cylinder barrels were made possible by utilizing the new nitriding furnace installed in the Wright plant. This huge furnace is used to treat the interiors of the cylinder barrels with ammonia gas heated to 1,000 degrees Fahrenheit. The nitrogen liberated by the ammonia combines with the carboloy steel to form one of the hardest surfaces known. Wear on the cylinder barrels is practically negligible.

One of the most interesting details of this new power plant is the installation of a down-draft carburetor, the only engine of its type ever to utilize this principle. Its advantage lies in the elimination of the intake of dust, dirt and cinders at airports, and water vapor while taking off from water. This latter fallacy in the carburetion of craft operating from water has been a source of endless engine failures and the ill-fated Post-Rogers crash has been blamed on present carburetion methods.

On an engine of such tremendous power, crankshaft vibration required special study and investigation. This research resulted in a new type dynamic damper which efficiently dampens out torsional vibrations on the crankshaft.

(*Concluded on page* 456)



**The Cyclone Model "G" and Myron B. Gordon, vice-president and general-manager of the Wright Aeronautical Corporation, get into the movies. It was remarked by Mr. Gordon, that the engine could speak for itself in a sound picture.**

# A History of the Cyclone "G"

by SWANEE TAYLOR

**And here, Mr. Taylor tells us, in his inimitable style just how the 1,000 horsepower Cyclone got started, why, and all the little historical points involved in the design and production. Our author visited the Wright plant to get this information first hand and—it was a long, long walk around the plant.**

THE story of the Model "G" Wright Cyclone engine is, in reality, a story of the problem of heat dissipation, or how to keep cool.

Starting with a 585 h.p. engine, which was a flop, due to its tendency to overheat and break crankshafts, the Wright engineers, through perseverance and an unwillingness to acknowledge defeat, developed a 1,000 h.p. motor which today knows no peer.

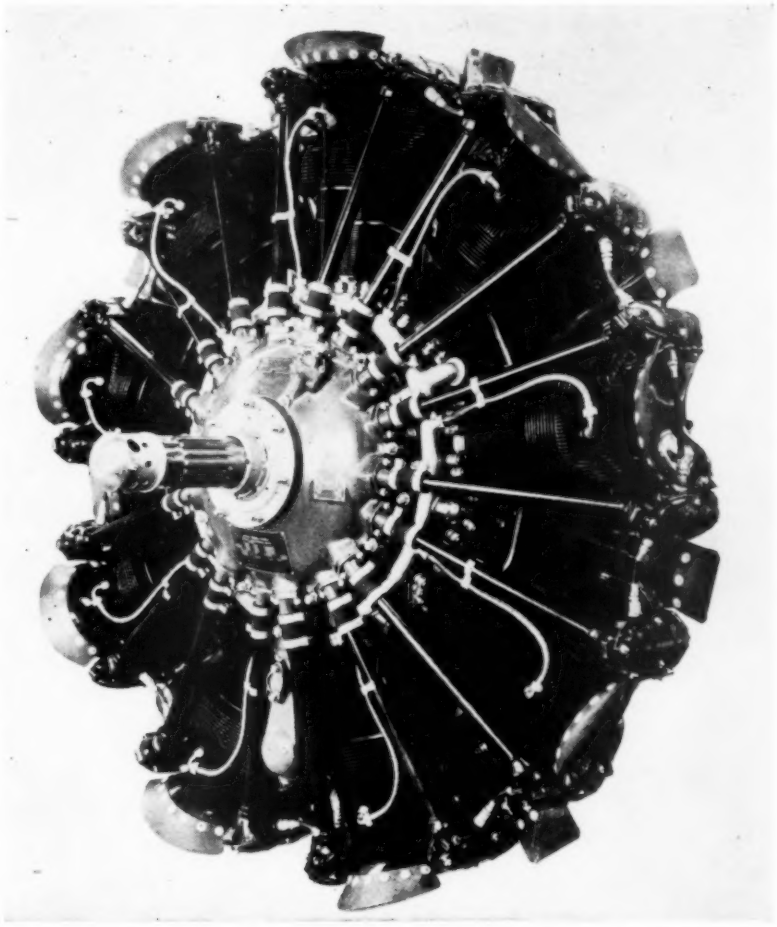
The first of the series of Wright Cyclones, built in 1924 to replace the Liberty engines in the Navy flying boats, opened the road to higher horsepower in the field of single-row radial engines.

But it was found that when the 500 h.p. mark was passed, the engines ran so hot that pre-ignition and detonations took place. Also, crankshafts seemed to snap habitually. Whereupon, internal combustion engineers everywhere declared sagely that single-row engines were forever limited to around 400 h.p. The Wright Company engineers, however, failed to agree with this pronouncement and set about proving their theories.

The first problem was to increase the cooling area of the engine. So the engineers' attention was turned to molding castings which would permit of closer fins. After much experimentation, days of heartbreaking failure, they finally arrived at an ingenious system of placing nails in the flask so ore sand would hold together until the casting cooled. This increased the cooling area vastly. Maybe they had the solution!

But no, increased surface wasn't enough she still ran terribly hot. Next, they hit on the thought that maybe airflow around the cylinder head was not properly controlled. Of course, all the drawings in the world would prove little. The proof of the pudding, in aeronautics, too, is in the eating and the Wright engineers had to build many experimental cylinders before they arrived at an efficient slip-stream control. Those leather tabs you see spread between the rocker-boxes, for example, are to seal the cowling, so that the air will be forced into the scoops between each cylinder.

In the meantime, while the air-conditioning was going on, other members of the staff were looking elsewhere for bugs. Then and there the engine began to be "refined." Somebody discovered that, by getting the oil out of the crankcase faster, they got an additional 70 h.p.; that exhaust valves with sodium-filled heads and stems provided a much more rapid dissipation of heat from the valve heads, and a couple more horsepower. A search for cylinder barrels to withstand the terrific heat led to a new barrel treated by means of a special process which gave an inner surface that was second in hardness only to the diamond.



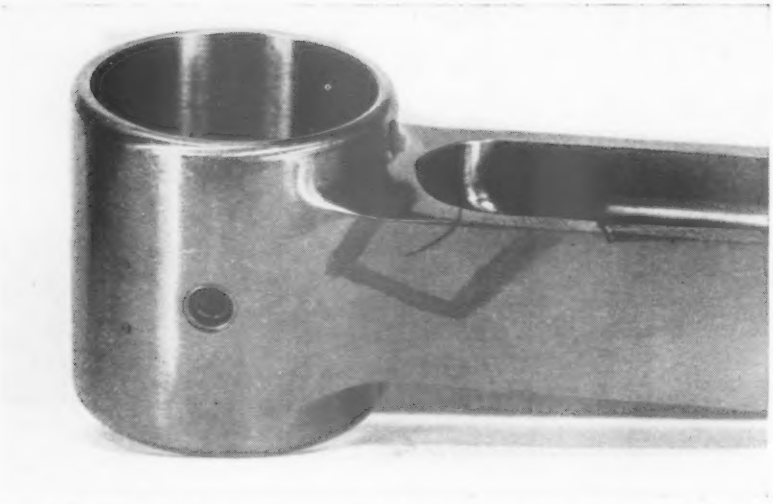
**Showing more of the details in a three-quarter view of the Wright Cyclone Model "G" engine, the valve-housings, wiring and other details.**

Another group of dogged individuals, in the meantime, had dedicated their efforts to clearing up broken crankshafts and that's why the dynamic damper was born. The trouble, it was found, had been due to torque vibration due to the explosion frequency in the cylinders. What had been happening was that each time one of the nine cylinders fired, a kick was imposed upon the crankshaft that was resisted by the inertia of the counterbalance. An undue twist was thereby imposed on the crankshaft at a point just behind the propeller hub. This had to be overcome or else single-line heavy duty engines were doomed to the scrap-heap.

It was a formidable challenge, but the Wright engineers accepted with alacrity. It isn't known how they went about it, but go about it they did and today we have an extremely simple dynamic damper. It creates a pendulum action by vibrating through a small arc when the counterweight moves. Centrifugal force is the restoring force on this pendulum, while the engine is running. Which is to say that, as the crankshaft rotates, the pendulum is thrown sufficiently ahead of the counterweight to damp out the kick of the explosions.

Another extremely interesting outcome of the Wright Company's self-imposed five-year-development-plan, is the "Magnaflux" metal testing device. In their quest for better metals, the engineers stumbled across this patented device, which reveals metallic flaws of submicroscopic minuteness. It is so simple

XUM



**The wristpin end of the Cyclone connecting rod, showing the black magnetic rouge (Magnaflux) piled up over and around a microscopic flaw in the material. A red paint diamond painted around the flaw indicates piece is to be finished.**

and reliable of operation that, since chancing upon it, all steel parts of Wright engines are tested by this method.

The test, incidentally, consists merely of first magnetizing the part to be tested, then submerging it in the Magnaflux solution, an iron oxide "magnetic rouge" stirred in boiling kerosine. If there is a flaw in the metal, the magnetic rouge packs into it, and leaves a mark on the spot. Unless there is a flaw, the "black rouge" won't adhere. Pilots who have witnessed this metallurgical test say that it gives them a sweetly serene feeling to fly behind a Wright engine.

All of the above development brought about the series "F" Cyclone, an 820 h.p. motor. By then the Wright engineers knew they had the answer and the series "G" was promptly launched. The fin area was greatly increased, once more, with the fins set at 7/32" (about as far apart as the teeth on a woman's hair-comb), and the spark plugs set in between the rocker boxes.

It must be remembered that this is the same engine, dimensionally speaking, as the old Cyclone Model R-1820. And the increase in power from 575 h.p. to 1,000 h.p. was accomplished with an increase in weight of a mere 200 pounds. The unit weight of the series "G" Cyclone is 1.1 pounds per horsepower.

**Performing the Magnaflux test on a motor part, already magnetized. It is dipped into the boiling magnetic rouge-kerosine solution while compressed air is employed for violently agitating the solution.**

## Stepping Stones of Aviation

IT is probably safe to say that more prize awards have been offered in aviation than to the pioneers in any other field of human endeavor. From the earliest days of aeronautical history prize offers have played a vital part in man's conquest of the air.

They have encouraged engineers and designers, as well as all other technical experts, to enter into research work that has speeded the development of motors, airplane parts and safety devices. They have spurred pilots to strive for new records and to blaze new trails across the skylanes of the globe. Prizes have, in a word, been the stepping stones of aviation.

One of the earliest of all airplane engines was constructed as the result of just such an offer. It was a prize of 100-pounds offered by the Aeronautical Society of Great Britain for the lightest and most compact motor shown at their exhibit in the Crystal Palace, London. The prize was won by Stringfellow who back in 1847 had built his first successful flying model. It was a second model designed by him in 1868 that won the first award in the annals of aviation.

At the dawn of the twentieth century a prize of some $20,000 was offered to the first person to circle the Eiffel Tower in Paris with a heavier-than-air flying machine mechanically propelled. The money was collected by A. Santos-Dumont who accomplished the feat in September, 1901 . . . two years before the Wright brothers flew above the Carolina sand dunes at Kitty Hawk!

On January 13, 1908, Henri Farman made a flight of one kilometer on a circular course, thereby winning the Deutsch-Archdeacon prize of 2,000-pounds.

Leon Paulhan completed a successful flight, April 28, 1910, from London to Manchester within a twenty-four hour period and with only one stop en route. For this achievement Paulhan was presented with the London Daily Mail's check for 10,000-pounds offered the first person to link these English cities by air.

One month later, on May 29, 1910, Glenn H. Curtiss made his epochal flight from Albany down to Governor's Island, New York. He set an American record for distance, a world's speed record for a cross-country hop.

On June 14, 1919, John Alcock and A. W. Brown hopped from Newfoundland into the trackless skies of the Atlantic. On the following day they set their plane down on Irish soil, completing the first successful trans-Atlantic passage by airplane. More substantial than all the glory and acclaim that greeted their accomplishment was their collection of the London Daily Mail's 10,000-pound offer for the first oceanic crossing.

In September, 1930, Dieudonne Coste and Maurice Bellonte piloted their

(*Concluded on page* 469)

VOUGHT SBU-1 NAVY SCOUT-BOMBER

# Lt. Marcel Viallet—Premier Hard-Luck Pilot

by CARL B. OGILVIE

**The astounding story of a French World War pilot who dealt daily in hard luck and 13's yet came out a winner after all**

EVERY squadron seemed to have its "Hard-Luck" pilot. Sous-Lieutenant Marcel Viallet was the hard-luck *chasse* pilot of the French Escadrille No. 67. His comrades called him "The Unfortunate One"; the Americans said he was just another "Hard-Luck Frog."

Hard luck came his way aplenty. But Viallet had what it takes. He could take it and hand it out. As if daring Fate and the gods of superstition to do their worst he picked out Friday the 13th to fight his most daring air-battle of the World War.

What's more, it was the Frenchman's 13th battle . . . and he recklessly fought a one-sided affair with none other than Captain Oswald Boelcke, father of mass-attack and winged murder. And believe it or not, at that time Boelcke had 13 victories to his credit. Stack all those 13's up against Viallet and you'll figure the odds were 13-to-1 against him living to tell about his crossing machine gun fire with the Boche Ace.

It is a stirring story of the phantom forces of superstition and failure combining with amazing coincidence in which the fateful Number 13 relentlessly hounded Viallet's life. It is more than just an account of a miraculous aerial victory. It is a thrilling story of Viallet winning against Boelcke and a moral victory he won with himself and against Fate.

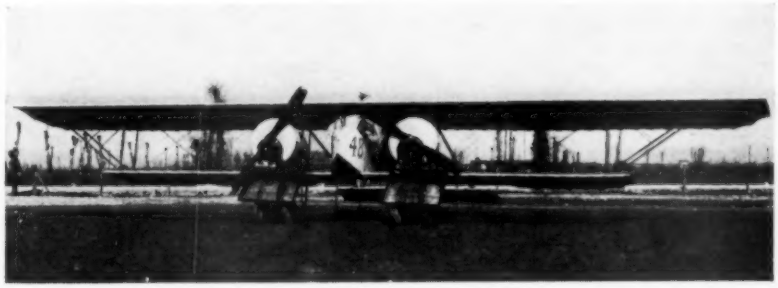
Viallet was an artist. He was a young man of delicate sensibilities with a passion for lovely and beautiful things. He drew splendid pictures with a fine-pointed pen. Harsh, gruesome war shocked him and made him almost ill of mind. He fought in the air force for his bleeding France, but he never gave up his art.

Even at the Front he made numerous illustrations of famous battles in the air and drew masterful pictures of his own thrilling encounters. At the close of the World War he had a complete illustrated record of his air service . . . the only record of its kind in existence.

* * *

FOR weeks after he came up to Escadrille No. 67 from the French Air Service pool, he was a wash-out pilot. Some thought the slender white hands of the artist were not strong enough to man the joystick and vibrating Vickers spade-handles. They said he had the esthetic soul of an artist; not the steeled cold-heart and rugged nerves of a fighting pilot. They wondered why this delicate painter of lovely pictures had been sent to a pursuit squadron.

Escadrille 67's chief assignment during the 1914-1918 show was escorting photographing planes over the enemy's lines. Its service was boring routine



**The twin-engined Caudron bomber of the type used by Lt. Marcel Viallet is obviously not well adapted to pursuit tactics and yet he successfully maneuvered it in combat.**

**Another view of the Caudron twin-engined biplane showing its great span—great at least for 1918.**

and sudden death. Vowing that he would get a *descendus,* Viallet would go on solo patrols after routine flights. Time after time he attacked the comparatively easy German targets—Rumplers, engaged in artillery spotting.

Easy as the prey appeared the slow heavy Rumplers always eluded his bullets and sent him back with Spandaus slug holes in the fabric of his tattered and torn plane. Always he was bested. His comrades knew he was not lacking in courage. He just wasn't the pursuit pilot type. They came to know their hard-luck pilot as The Unfortunate One.

Viallet slowly began to regard himself as a failure—a soldier who had followed his country in its hour of greatest need. The young French artist-pilot was heartbroken. Then one day a devastating fear smote his befuddled brain. "I'll never be able to knock down a Boche," he admitted to himself. Viallet was washed-up. Licked. Licked by his own estimation of himself. A pilot in that frame of mind is a total loss to the service.

* * *

DURING the battle of Verdun-Froidos, Captain Saint Sauveur, C. O. of the Escadrille, realized something had to be done. Viallet had a great battle to fight. He must fight off his fear of failure. Fight it out alone! The C. O. ordered him on a one-man patrol between the Meuse loop and the Argonne.

The morning was cool and clear as crystal. Above Montfaucon, 15 kilometers behind the Boche lines, Viallet spied a German aviation field. A lone Fokker was climbing into the morning sky. The pilot saw the approaching French plane, and set her down pronto.

The sight of the enemy pilot turning back to his drome—afraid to fight—burned the Frenchman with a yen to give battle to the bitter end. Suddenly, Viallet saw off in the distance, over Avocourt, a Rumpler. A peculiar chill passed over him. Was he afraid? Was he heading his throbbing ship to stalk a man to his death? Or would he himself be the victim of Fate? Rumplers, the first ships to appear at the Front with steel tubing fuselages, were his hard luck!

"I'll get him! I must. I will! Always I have been defeated. Today I shall win!" he yelled furiously into the slipstream as he kicked hard rudder and jockeyed for a position of advantage.

But the Rumpler's pilot saw him coming and whipped around to meet the little French plane. A brave fellow this Boche. The two foes quickly swung within firing range, neither giving away to the other. The Boche opened fire first. But Viallet never wavered. Straight for the Boche he flew, alternatively banking right and left to avoid the hail of lead the twin Spandaus were spitting at him.

A weird feeling came over the hard-luck pilot of 67; it gnawed at his heart. Pure intuition both strange and dar-

ing in the utmost made him, for the first time in months, feel confident of one thing. A very indefinite thing. But his mind was made up. He would be victorious this time, or die in the attempt. He couldn't go on being a hard-luck pilot! It was unbearable.

The French pilot held his ship straight for the Rumpler. Deliberately he kept his finger off his machine gun trigger. He wanted to be close! Be sure. Positive. He must not fail to kill—or be killed.

Alarmed that the Frenchman had gone suddenly mad and intended crashing into him, the Rumpler pilot tried to zoom up over Viallet's plane. A climbing turn would bring him on the tail of the little French craft as it overshot under him.

But, in that moment of desperation, the Boche pilot pulled too hard on the stick. Up shot the nose of the Rumpler at too stiff an angle. Viallet could hear the whine of the Mercedes and see the tautness of its wires. The 160 h. p. Mercedes sputtered, conked! The Rumpler fell off on its back in a crazy stall.

Viallet, his heart pounding up in his throat from excitement, realized *his* moment had arrived. He had time for one quick pumping of the C. C. mechanism. Time for one swift glance at the breech of his Vickers. Quickly he jockeyed his ship into position before the Rumpler righted. The Frenchman clutched the trigger of his machine gun as the Boche dropped into his ring sight.

Rat-a-tat-tat.

A short burst of four bullets!

Only four bullets but Viallet had won his first victory—a flamer! The Rumpler plummeted to earth in flames.

The Frenchman's great joy of success was quickly cut short by the roar of an approaching plane. Viallet looked back over his shoulder. A Hun plane was closing in on his tail. Viallet tossed his ship in a lightning vertical, turning on the flippers. Again he withheld his fire until the exact split fraction of a second. The Boche roared in within range.

Rat-a-tat!

A burst of three! The second machine also burst into flames!

Two victories. Two flamers! Seven bullets. Viallet's fear and inferiority complex vanished with the falling foes. The artist had become a fighter. A fighting pursuit pilot!

But even after those two splendid victories hard luck still hounded Viallet. His victories were few and far between. His battles totaled 12 and his victories only 2. Comrades shook their heads. If he should win his 13th battle, would the fateful ominous 13 be in effect? Would it be his last? Boelcke's staffel was reported to be on the other side of the lines.

Few of them dared hope that their hard-luck pilot would brush death and cross machine gun fire with the Master Boelcke himself, over Verdun's crimson battlefield—and come back alive.

(*Continued on page* 464)

## More Dope on the McGaffey "Aviate"

by BURTON KEMP

**This side elevation of the Aviate shows the unusual outrigger construction for the support of the tail group and the faired nacelle.**

PHOTOGRAPHS of the McGaffey "Aviate," the new "auto-engine" powered low-wing, have appeared previously in POPULAR AVIATION, but beyond these, little information concerning it has been published.

Recently, however, this plane completed its flight tests, and the designer, Neill F. McGaffey, has formed the McGaffey Airplane Development Co. with the hope of putting this plane into production in the very near future. The chief designing engineer was F. M. Smith.

Vance Breese, noted flyer, conducted the test flights. Breese is very familiar with low-wing ships, as he recently had a hand in the design and construction of a 6-place all-metal job which looked very much like a smaller version of the Vultee V-1A. This plane had a 500 HP P & W Wasp power-plant and a retractable landing gear. For a time it was the property of the Lambert Aircraft Corp., but was later returned to the builders. When last heard of, it was on the West Coast, where it had the role of a mystery bomber in a movie depicting one of the recent South American conflicts.

But we've drifted away from our subject, the McGaffey Aviate, a plane which should be interesting enough to hold our attention for some time. As can be seen clearly in the accompanying photograph and drawing, the fuselage is in reality just a nacelle and is only large enough to accommodate two persons and the Ford motor. To the rear of the passengers' seats, the fuselage tapers to a point and the tail surfaces are carried on booms which are extended from the wing.

The wing, itself, is of conventional design and construction, using two solid spruce spars and dural ribs. The covering is fabric. The original design called for trussed type wooden ribs and a covering of spruce plywood. However, this and other minor changes were made, as will be explained from time to time. All external parts are attached to the wing by welded steel fittings which, in turn, are bolted to the wing spars at the attachment points. The external bracing is taken care of by streamline struts.

Fuselage framework and engine mount are of welded steel tubing and both cowling and covering are of aluminum alloy sheet. The firewall is just in front of the leading edge of the wing and is shown on the drawing by the dotted line. It is made of steel.

The Ford V-8 engine is mounted in the nose just behind a standard Ford grill and radiator. The position of the motor has been lowered since the original design, which gives the center of gravity a better position. A reduction gear is employed to lower the speed of the propeller and has a ratio of 1.885 to 1. Dry weight of the converted unit, including starter and generator, is only 480 pounds. At the maximum propeller speed of 2,000 RPM, it has an output of 100 HP. A 7′-8″ wooden propeller with metal tips and leading edge is used. Unlike most aircraft engines, the Ford motor turns in a counter-clockwise direction, as viewed from the cabin.

Welded steel tubing and an oleo shock-absorber are used in the undercarriage. This structure is enclosed by pants of aluminum alloy sheet, and is open at the front to almost the entire height of the wheel, as well as at the bottom. It was originally intended to have these open only at the bottom, which is the general practice. The tail wheel is of the 360 degree swivel type.

Tail surfaces are constructed exclusively of aluminum alloy sheet, with spars ribs and covering of this material. The joints are riveted and struts are used for external bracing. All controls are hinged at one side, as shown in the drawing, and not in the center. Also, it will be seen that the line of the hinge between fin and rudder is not perpendicular to the line of flight, as is usually the case. Ailerons are also of all-metal construction.

The tail booms are of aluminum alloy sheet, which is riveted to a box section.

(*Concluded on page* 462)

# Benny Howard's New Ship

by JANE H. MEYERS

THE launching of a ship—what do those five words convey to you? The completion of months, maybe years of dreams come true, countless hours spent in measuring, calculating, computing reams of figures, monies invested by people who had faith in an idea, a means of transportation that can bring romance and adventure in far off places.

No fanfare, flag waving or bands playing marked the test flight of Benny Howard's new four place passenger plane. There were, perhaps a dozen of us in the Air Associate's Hangar at Chicago Municipal Airport where he had assembled his plane. Mechanics, the usual group of airport loungers that seem to evolve from nowhere, another scribe besides myself, Mrs. Benny Howard, and some pilots from a neighboring field.

Benny Howard has been flying since he was seventeen years old—and now, at the age of thirty-one, he is one of United Air Lines' crack pilots on their Chicago-New York run. Although he had achieved national prominence with his famous racing planes MIKE and IKE, he made racing history when at the 1935 National Air Races in Cleveland, he ran home with the Thompson Trophy Race, the climax of four days of speed. To the amazement of the spectators this feat was accomplished with a cabin plane.

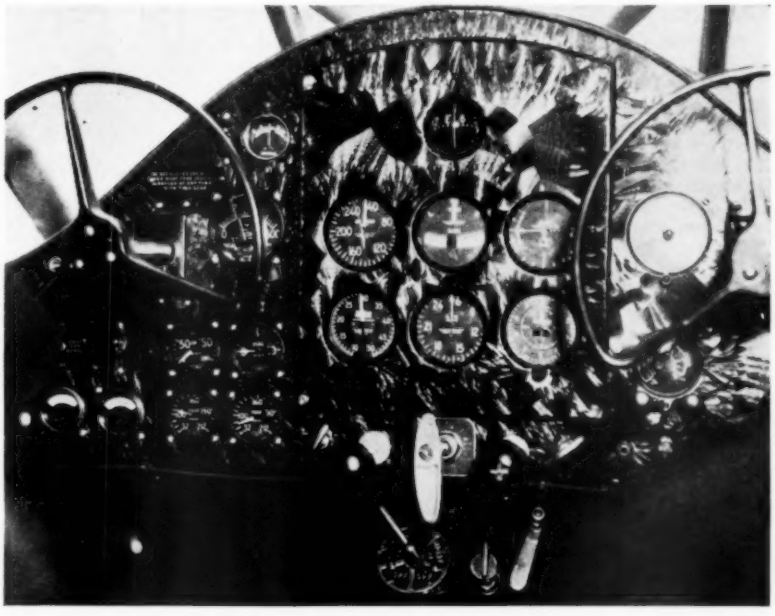
Returning to Chicago after that victory, Benny Howard and his mechanic Gordon Israel completed the design of their speedy four place cabin job, planned solely to transport passengers. Having no available hangar they rented a store on the ground floor of an apartment building near Chicago Municipal Airport. They were only able to get a four months' lease on the store, and that meant unceasing work on their part, utilizing every moment in order to complete the airplane in the short space of time.

Veteran manufacturers of planes said that it couldn't be done. They pointed out that they, with all the facilities available to them at their modern factories, could not possibly turn out a newly designed plane in less than six months. To all of which Benny Howard and Gordon Israel smiled, shrugged their shoulders, and wasted not a moment in idle talk.

At the end of the four month period the embryo manufacturers proudly and carefully loaded their ship on a trailer, and hauled it to the Air Associate's Hangar where they completed the final assembling.

"We had a hard time deciding on a

**A side view of the new Howard plane, the test flight of which was witnessed by the author.**



**The instrument board of the Howard plane.**

**And now we have a front view of the Howard Cabin plane which is attracting much attention.**

color scheme for our plane," Benny Howard confided to me. "We wanted something original, something that had never been used before." I glanced at the ship as it stood on the line. The cowling, part of the fuselage and the pants had been painted a bright blue, while the rear of the fuselage and the wing surfaces were a gleaming copper that glistened and sparkled in the sun's rays.

Attending to last minute details occupied Benny Howard's attention and he hurried off to carefully supervise a final inspection before hopping off. Mrs. Howard walked over to where I was standing, and a word here about this unusual woman.

Petite, blond, extremely pretty, she was attired in her usual costume of smart grey flannels, checked grey and black sport coat tightly belted, trim black sport shoes, and a jaunty black beret. No unnecessary feminine fripperies that could get out of place in her costume—no high heeled shoes, tight skirts or scarfs waving in the breeze for this pilot,—for she holds a private license. Mrs. Howard flies a Fleet, Waco or Stinson, "anything that's available" she told me. She does not clutter up the landscape, as most women have a habit of doing at an airport, and as she had more or less a right to do at this epochal moment in the Howard family's aviation history.

Quietly she stayed in the background, watching her husband efficiently check and double check his plane with the aid of Gordon Israel. As the time arrived for the initial flight she moved over to his side, and they stepped away from the crowd, seeking a moment of privacy. What they said to each other in those few moments before Benny would take the ship aloft will ever remain a mystery, but I have never seen such perfect understanding between two people.

Walking to the plane with the casualness that made the onlookers forget for a moment that it had never been off the ground, Benny turned on the switch, started the motor, let it warm up, and taxied it out to the field.

(*Concluded on page* 462)

**Looking at her right on the nose shows the clean flowing lines of Benny Howard's new speed cabin.**

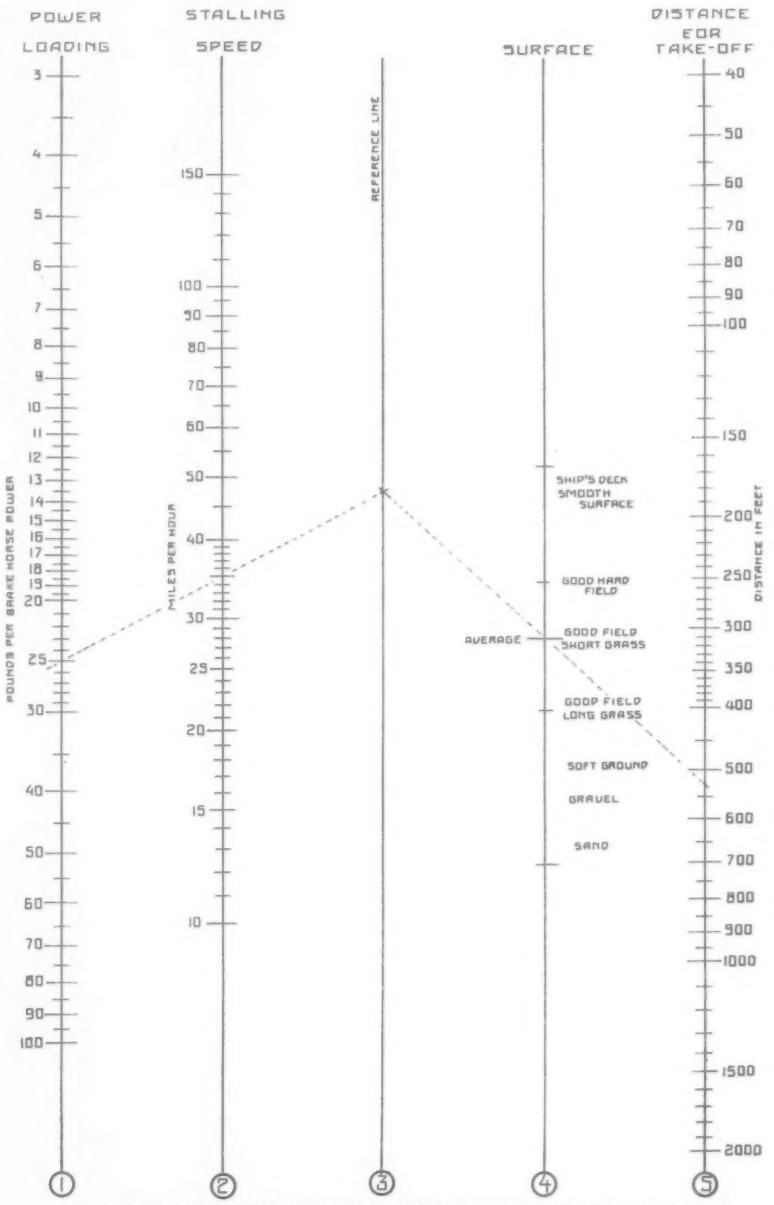
## Nomograph for the Take-Off Distance

**By RAOUL J. HOFFMAN**

THE previous issue gave you the distance required to clear an obstacle after taking off the field. Adding to this distance the run necessary for the take-off you will have the total distance needed to clear an obstacle from the start.

The decisive factors for the length of the take-off run of an airplane of standard design are the power loading, the stalling speed, the condition of the contact surface (airport), the efficiency of the propeller at the take-off, the airplane characteristics and the experience of the pilot.

The accompanying chart will enable you to estimate the take-off distance for various ground conditions when the power loading and the stalling speed of the airplane are known. A problem shows power-loading and m.p.h. projected to reference line and thence to field condition and take-off distance.


POWER LOADING
POUNDS PER BRAKE HORSE POWER
STALLING SPEED
MILES PER HOUR
REFERENCE LINE
SURFACE
SHIP'S DECK SMOOTH SURFACE
GOOD HARD FIELD
AVERAGE
GOOD FIELD SHORT GRASS
GOOD FIELD LONG GRASS
SOFT GROUND
GRAVEL
SAND
DISTANCE FOR TAKE-OFF
DISTANCE IN FEET
1
2
3
4
5
EXAMPLE: TOTAL WEIGHT 1000 LBS. 40 B.H.P., 35 M.P.H. STALLING SPEED. FIND THE TAKE-OFF DISTANCE FROM THE AVERAGE FIELD. CONNECT 25 (1000÷40) ON SCALE NO.1 WITH 35 ON SCALE NO.2. INTERSECTING LINE NO.3. CONNECT POINT ON LINE NO.3 WITH "AVERAGE" ON SCALE NO.4 YOU WILL FIND LINE INTERSECTING SCALE NO.5 AT 525 WHICH IS THE DISTANCE FOR TAKE-OFF IN FEET

# Stunting With the Gates Circus

by JOSEPH R. JAMES
TRANSPORT PILOT No. 56

**This is the second story in a series telling of the experiences of the author while engaged as a stunt pilot in one of the oldest and greatest flying organizations this country has ever known.**

NO other flying outfit in the world has so completely captured the imagination of the public as the daredevil happy-go-lucky Gates Flying Circus.

There have been individual performances that have left headlines shrieking across continents, but in a collective unit of courage, daring, and exhibition of sheer genius in handling a plane, there has been none to equal the Circus of the Mad Twenties.

And so it is little wonder that, looking back, I feel it a rare privilege to have been a member of that group which so effectively created barnstorming history.

It was only a few days after we had completed the "Greatest New York Air Show" that I was assigned to another ship and ordered to proceed to Port Jarvis in advance of the outfit. The circus was scheduled to be there that week-end. I piled in gas-cans, strainers, stakes, tie-down ropes, Johnny's heavy exhibition 'chute and Johnny himself. My own mechanic, Nick, was appropriated by Pangborn for the time being.

After revving up the motor, I discovered that it would miss on one bank when the throttle was opened wide and so, after a considerable search with Warren Smith's help, we located and fixed up an air leak. As the motor now barked steadily and turned up well with open throttle, I taxied in position and started taking off.

With a normal run behind me, I took off smoothly and put the ship into a gentle climb. I could not have been more than a hundred feet high when the motor started slowing down and I felt the ship was losing altitude. I tried to turn but the plane started slipping in and the dangerous meadows started coming up to meet me. I then decided that I had better continue my flight in a straight line ahead, even though I was steadily losing altitude. Coming down in the meadows would not only mean a bad crack-up, but it would also be impossible to reach dry land or for anyone else to reach the crack-up from shore. It was a bad swamp where one would be mired hopelessly when once down in it.

Tree tops, telephone poles, wires and houses were slipping past me fast and our ship was almost scraping them. Desperately I looked for a soft place to crack up the ship, but none was in sight for we were directly over a little Jersey hamlet on the edge of the meadows just south of Teterboro field.

Suddenly, a number of greenhouses loomed up directly ahead with a small garden in the midst of them. I could see the freshly planted rows of celery, lettuce, cabbage and even spinach, as I shouted to Johnny to hang on. I couldn't hold the ship up a second longer—so I cut the switch.

**Just old Jenny in another pose with her OX-5 engine and all of the trimmings. For years she was the one best bet of the barnstorming pilot, and outlived the war by a comfortable margin.**

I pancaked the ship, pulled her nose up as high as it would go so as to drag the tail-skid and slow us down before the wheels touched the soft rows of black dirt in the garden. It worked so beautifully, I'm sure I would never repeat the performance for any amount of money.

The tail-skid hooked the soft dirt as I planned, or rather prayed it would, made a deep furrow about twenty feet long and when the wheels hit the celery patch, I felt the ship's tail rise slowly to a 45 degree angle towards the ground —and stop.

Johnny was out of the ship in a second and helped me to get down from my elevated position. When I took a good look, I was amazed to see the ship stuck in the black dirt at this queer angle. Where the tip of the wooden propeller touched the dirt was a deep row between two high beds of celery so that even the propeller was undamaged.

On all three sides, and not more than fifty feet away, were glass greenhouses completely encircling us. I shuddered when I thought of what might have happened had we squatted on top of one of them.

As I hurried back to the field for help, leaving Johnny behind for no good reason—for surely no one could hop off with that ship in its present position—I was preparing for the worst. When the "Pope" heard my story he was as mad as a hornet and was ready to fire me on the spot. His philosophy was simple. Men were plentiful, but ships were hard to get and tougher to put together in those days.

Van, two mechs and I climbed in the boss's car and, with the "Pope" at the wheel, proceeded for the scene of our mishap. Gates took one look at the ship, surveyed the situation with a glance around, his eyebrows climbing a couple of inches as he took in the greenhouses. Then, turning to me he remarked tersely,

"Any man who can bring a ship down on a celery patch amidst a lot of glass houses and not damage it one bit, deserves another chance." He stalked off across the truck garden, tripped over some green leaves and muttered disgustedly—"Spinach!" I couldn't help grinning in relief. After all those years, I had got even with spinach at last!

The ship was quickly disassembled, carted back to the field, reassembled, rigged again and ready to take the air. Later I discovered the owners of the garden started a damage claim for hundreds of dollars but, after a hot argument with the "Pope", quickly settled for twenty-five dollars. It was more than a pleasant surprise because even that sum wasn't taken out of my salary.

Since the lamented and harrowing arrival of Roy Ahearn at Teterboro field, the keenest kind of a rivalry sprang up between us. If I was engaged in aerobatics, he did his utmost to outdo me; if we were working hard carrying passengers, he always tried to haul more passengers by getting around the field faster and sneaking his old Liberty "6" Standard just under and ahead of me, nosing in for a landing first.

All this amused me no end, because I knew that all I had to do was to keep flying steadily and sooner or later Roy's motor or his plane would defeat him in his efforts to outstrip me. During the brief spells we rested on the ground, Roy's chant became nothing but a fu-

XUM

neral dirge, "If I can only beat this Joe James, I'll be satisfied!" But when a ship is going, even the Angel Gabriel can't keep it up any longer and prayers aren't of much use when an old casket's ready to hit mother earth.

One week-end we were working hard in Port Jarvis, Pa., near an old railroad junction where the corners of the states of Jersey, New York and Pennsylvania come to a point. The Delaware river cut through a dense mountain ridge and swerved abruptly to the left in the northerly direction.

Outside of Bill Brooks and Warren Smith, who were left behind to teach the flying art to the son of a socialite or a Brooklyn banana peddler who wanted to come down quicker than he went up, the whole outfit was here.

Buckey Steele, Roy Ahearn, Lee Mason, Pangborn and myself were flying Standards and Ives McKinney was pushing a Curtiss R, a huge biplane with three cockpits and powered by the well known Liberty "12." Mac, the inevitable nickname of McKinney, would load up his both cockpits to the limit, give her the old gun and take off with the Liberty sputtering and coughing black smoke as the clumsy crate gathered speed over the rough ground.

Every one of Mac's take-offs was thrilling, for it was an even bet whether his engine would stop belching smoke screens as it rumbled away or fail to pick up the skipping cylinders and pile up at the end of the dangerously short runway.

But Mac believed in his lucky star more than the others and, at the last second, the motor would pick up and supply the urgently needed power to lift his huge crate over the tree tops. At the end of the day, Mac's face would be black with soot and with an arrogant laugh, he'd answer our jibes with, "When I am black, I am rich."

And it was true. We stopped riding him for pulling a mammy act when we counted up his successes at the end of the day.

We spent two hard days of flying and torturing the old crates up in the air with antics they were never intended to perform and, just as we were getting set to hop off for Poughkeepsie, I discovered that one of my landing-gear V's was just about ready to cave in. After a careful inspection and upon Pangborn's suggestion, I remained in Port Jarvis an extra day to wait for a new V-strut which was being shaped out by a local carpenter in town.

That's how Nick and I were left behind and the next day we proceeded alone towards Poughkeepsie. Flying low over mountainous and thickly wooded country without any identifying landmarks and with a somewhat vacillating compass that could rarely make up its mind how to act, we passed up Poughkeepsie about ten miles to the left and south of Kingston without sighting it.

Was my face red when we had to

(*Concluded on page* 452)

## They're Off at the 1910 Air Derby!

**Here they are, lined up for a race-horse start at the 1910 Classic, which netted the winner $10,000 in a very few minutes. The lineup is: (3) Grahame White, the winner; (7) T. O. M. Sopwith and Earle Ovington.**

WHEN the National Races are held this year, the contenders will have every facility and convenience that 30 years of continuous development can give them, but there was a time when things were pretty much in the raw—and this is the fact set forth by the accompanying picture.

The principal reason for the 1910 holocaust was the $10,000 Boston Globe prize tour which started from this field near Boston, Mass., and circled the Boston light, a round trip of 33 miles. Very remarkable to state, the excursion was attended with no casualties and a pleasant time was had by all.

It was a purely informal function, as will be seen from plane No. 7, where Mr. T. O. M. Sopwith is about to start the tour in his shirt-sleeves, his eyes guarded by goggles to fend off the castor oil and other debris issuing from the exhaust of the Gnome rotary. We can't quite figure out how the starter and his flag are going to get out of the mad rush, particularly with his back turned to the fray—but he probably had that all doped out.

In the foreground, No. 7, is a Bleriot XI monoplane equipped with a 70-h p. Gnome oil sprayer. Next to him, and in a precarious position, No. 3, is Grahame White in a Nieuport monoplane provided with a 100-h.p. kicker. Grahame won the race with his 30 additional h.p. Earle Ovington, in the background, was the pilot of another 70-h.p. Gnome-Bleriot. And, away over near the audience is a Model "B" Wright biplane that had evidently been doing some passenger carrying in odd minutes.

## Lunken Airport is Cincinnati's Pride

LUNKEN AIRPORT, located near Cincinnati, Ohio, is one of the most modern and best equipped airports in the United States, and one where a great deal of experimental activity has been noted. It was here that Lanier experimented with the "Vacuplane", as one example.

But, in a commercial sense it is as famous. Aside from the transport liners landing here, it is the headquarters of the Aeronca lightplane.

**A view of Lunken Airport, Cincinnati, Ohio.**

# Stress Analysis Made Painless

by RAOUL J. HOFFMAN

**The second article in a series, giving short-cut methods of analyzing stresses. In this article, the subject of beams and bending moments are covered in detail.**

DUE to the increased loading encountered by higher speed ratios, every ounce of material used in the structure of an airplane is loaded to the highest stress permissible in order to increase the payload.

This leads to a closer estimate of stresses and riskier assumptions, resulting in a disaster in the air. However, all stress estimate can be derived from elementary loading conditions and simple stresses.

This article will deal with simple bending stresses on statically determined structures, when it is possible to compute the external reactions and resisting moments by elementary analytics, without reference to deformation or elastic constants.

A beam is a rigid body subjected to parallel transverse forces. View the lower right hand sketch on the nomograph, a cantilever beam fixed in the wall with an upward load applied at the end. This load will bend the beam upward and create a tension on the lower surface of the beam and a compression on the upper surface, called the internal forces.

The line where the tension changes to compression is the neutral axis and usually at the gravity line of the section. The distribution of the internal forces depends on the cross-section of the beam; this shape factor is called the section modulus, denoted as I/y, I/c, S, Z, etc.

The stress used in bending calculation is called the modulus of rupture, an experimental coefficient, a composite stress of tension, compression and shear stresses.

The external moment or bending moment must be in equilibrium with the internal moment, that is

M-Wxl/f, M-wxlxl/f, M-I/cxS

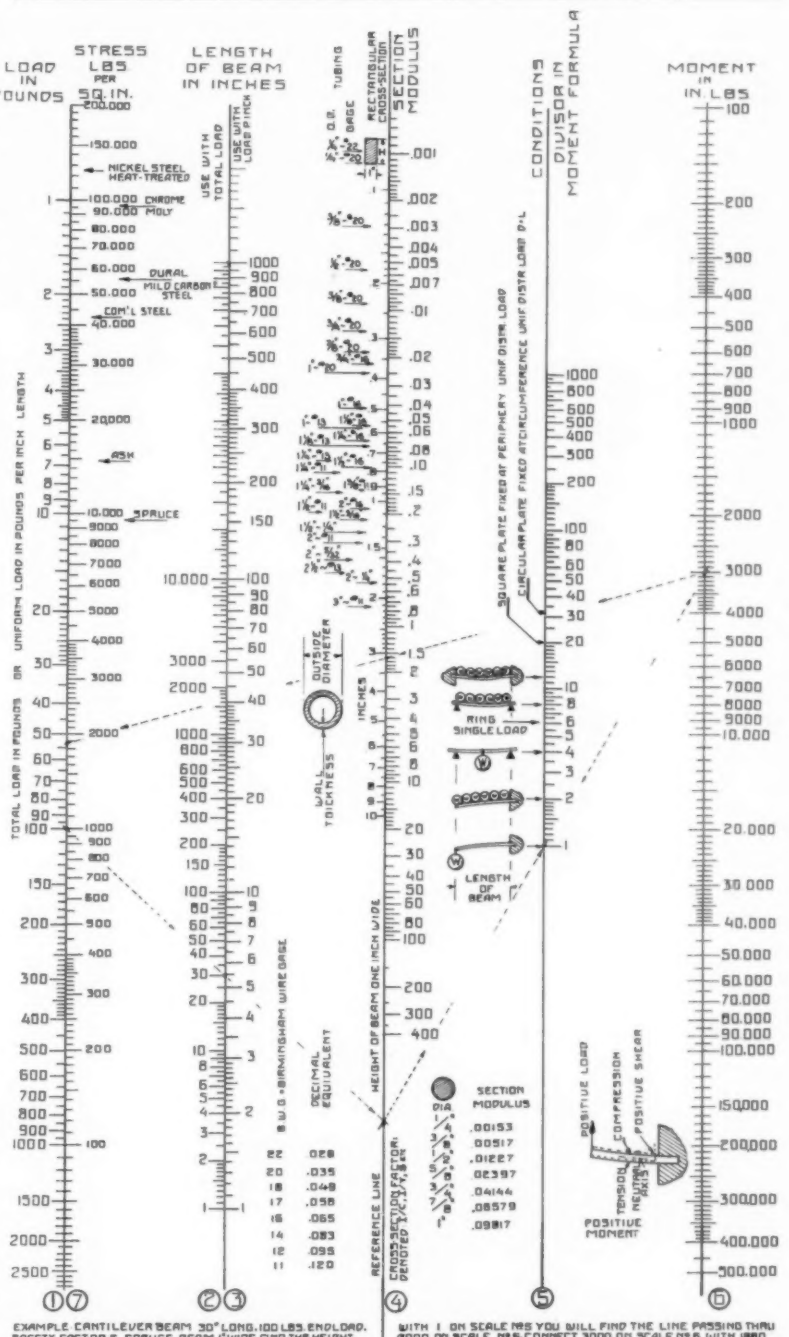
where (M) is the bending moment in inch-pounds, (W) the total load in lbs. (w) the load pounds per inch run, (l) the length of the beam or beam section in inches, (f) the constant, and (S) the resultant maximum fiber stress in pounds per square inch.

The bending moment depends on the loading condition which is usually denoted by the constant (f); this constant is (1) for a cantilever beam with an endload, (4) for a beam supported at ends and concentrated load at center, (8) for a beam supported at ends and uniformly distributed load, (12) for the same beam with fixed ends, etc. This is for maximum bending moment only.

The section modulus I/c for a rectangular section is bxh⅔ where (b) is the width and h the height of the beam in inches; I/c for round section is .10xd³

(*Concluded on page* 460)

## This Chart Solves Beam Problems


LOAD IN POUNDS
STRESS LBS. PER SQ. IN.
LENGTH OF BEAM IN INCHES
TUBING
RECTANGULAR CROSS-SECTION
SECTION MODULUS
CONDITIONS
DIVISOR IN MOMENT FORMULA
MOMENT IN IN. LBS
NICKEL STEEL HEAT-TREATED
CHROME MOLY
DURAL
MILD CARBON STEEL
COM'L STEEL
SPRUCE
USE WITH TOTAL LOAD
USE WITH LOAD P INCH
TOTAL LOAD IN POUNDS OR UNIFORM LOAD IN POUNDS PER INCH LENGTH
SQUARE PLATE FIXED AT PERIPHERY UNIF DISTR LOAD
CIRCULAR PLATE FIXED AT CIRCUMFERENCE UNIF DISTR LOAD P-L
RING SINGLE LOAD
LENGTH OF BEAM
OUTSIDE DIAMETER
WALL THICKNESS
INCHES
B.W.G. - BIRMINGHAM WIRE GAGE
DECIMAL EQUIVALENT
HEIGHT OF BEAM ONE INCH WIDE
REFERENCE LINE
CROSS-SECTION FACTOR DENOTED
SECTION MODULUS
DIA
.00153
.00517
.01227
.02397
.04144
.06579
.09817
POSITIVE LOAD
COMPRESSION
POSITIVE SHEAR
TENSION
NEUTRAL AXIS
POSITIVE MOMENT
EXAMPLE CANTILEVER BEAM 30" LONG. 100 LBS. END LOAD. SAFETY FACTOR 8. SPRUCE. BEAM 1" WIDE. FIND THE HEIGHT. MAX. STRESS FOR SPRUCE 9400 LBS. P SQ. IN. 9400÷5=1880. CONNECT 100 ON SCALE N#1 WITH 30 ON SCALE N#2 INTERSECTING REFERENCE LINE N#4, THEN CONNECT THIS POINT
WITH 1 ON SCALE N#5 YOU WILL FIND THE LINE PASSING THRU 3000 ON SCALE N#6. CONNECT 3000 ON SCALE N#6 WITH 1880 ON SCALE N#7. YOU WILL FIND THE LINE PASSING THRU 1.6 ON THE RIGHT SIDE OF SCALE N#4, WHICH CORRESPOND TO A BEAM 3.1 IN. HIGH 1 IN WIDE.

## The G. H. Q. Takes Over Loutrel Engine

A G.H.Q. gas powered model equipped with a Loutrel engine.

THE Loutrel model gasoline engine, long famous for its reliability and performance, is now being manufactured in mass production by The G. H. Q. Model Airplane Company.

The present engine is a development of the original Loutrel, and six years of constant improvement have given a more powerful, reliable, easy-to-start, steady running engine. The engine has already turned in hundreds of flights, ranging from a few minutes to four hours, depending upon the amount of gasoline used.

The G. H. Q. Loutrel engine fills the need for a low-priced durable motor and it is expected that thousands of model builders, hitherto out of the gas-model field because of expense, will now be able to participate in the greatest of outdoor sports. The cost has been brought down largely by the great production rate, as many as 10,000 of certain parts being ordered at one time to secure the best possible price.

This engine has a bore and stroke of 15/16x3/4 inch and runs at speeds ranging from 500 to 10,000 r.p.m.

## Discussion on Stress Analysis

WE WERE in receipt of several letters from our amateur physicists, criticizing the contents of the article, Strength of Materials Made Painless, that appeared in our April issue. Most of our correspondents have been erroneously nursing the idea that acceleration due to gravity is constant all over the earth's surface, which, of course, is not true.

In fact, the value of "g" undergoes a considerable variation, even locally, and various aerial navigating instruments have been designed from time to time with this principle as the basis of their operation. Our correspondents overlook the fact that the gravitational effect is greatest where the mass is greatest and this is the case with our earth, which is not a true sphere but an oblate spheroid with its greatest diameter at the equator.

It is evident, therefore, that gravitational acceleration "g" must vary with the latitude, either north or south of the equator. Brinelli's automatic navigator is a special version of Kater's pendulum which determines latitude by gravitational variation.

In this instrument, the latitude is determined from "g" as solved by the following equation:

$$g = 32.1721 - 0.08211 \cos 2a$$

Where: g = gravitational acceleration at any given latitude.
a = latitude in degrees.

This is true on the ocean's surface, or at sea-level, but is influenced locally on land by the presence of mountains or other deviations in the earth's surface which increase or decrease the local mass. It was not long ago that a patent was taken out on an instrument that warned the pilot of mountainous approach by a delicate gravitational balance operating in a horizontal plane.

That the acceleration of gravity decreases with the altitude above sea-level is given by the following well known equation in which the gravitation decrease (g') is represented in terms of: 0.000003h, where (h) is the altitude in feet.

Thus, combining the effects of latitude and altitude variation, we have:

$$g = 32.1721 - 0.08211 \cos 2a - 0.000003h$$

This equation, in its entirety, can be found in Mechanical Engineer's Handbook by Lionel S. Marks and in several books on analytic mechanics. We have quoted the equation as it appears in Marks and have omitted, for this reason, the parentheses which may seem indispensable to such critics as "Old Slide-Rule Pusher," who very discreetly avoids signing his name to his letter.

There was, however, a typographical error in one of the equations which we hastened to correct in the May "Airy Chat" and to which we again call your attention. The distance factor (D) was omitted, for some reason not known, and should read:

(*Concluded on page* 456)

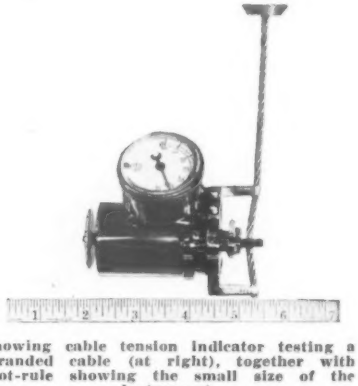
## Shunt Type Cable Tension Indicator

ACCURATE measurement and equalization of tension on small cables can now be accomplished through the use of a tiny new instrument that has just been perfected by the Martin-Decker Corporation, Long Beach, Calif.

The new device weighs only seventeen ounces and its overall height is 3½ inches. It operates on the deflection principle and actual tension is obtained by simply clamping it on the cable. Loads from ten to two hundred pounds, on small cables up to 3/16 inch diameter can be measured accurately and quickly, the device being self-contained, automatically adjusted for temperature changes and requiring no special bushings or cables of different sizes.

The instrument was developed in response to the request of one of the large aeroplane manufacturers for something that would make it possible to determine definitely the tension on the many small cables that are so vital in aeroplane construction.

However, small cables are used in so many other places that the device is rapidly being adopted for many other uses. The Army and Navy have found that it meets their requirements for accuracy and supplies information not heretofore dependably obtainable.



Showing cable tension indicator testing a stranded cable (at right), together with foot-rule showing the small size of the instrument.

## Hydraulic Propeller Brakes

HYDRAULIC propeller brakes have been installed for tests in actual operation on the new Sikorsky S-42 used on the Pan-American flights across the Pacific.

The brakes are not used for bringing the plane to a dead stop, but on the contrary are designed to increase speed and maneuverability. When an airplane lands, the engine is of course throttled down. In spite of this, the rush of air against the propeller causes it to continue rotating which sets up a turbulance over the wing behind it. This turbulance results in lower lift.

The new system stops the propeller altogether and it remains motionless until the throttle is opened up, eliminating the disadvantages of windmilling propeller.

# Just Another Lightplane Roost

by EDWARD A. PISZCZEK

**Here is another entrant in the low-cost hangar discussion who offers a good looking plan for a lightplane hangar. Look it over carefully. Perhaps it will be the answer to your storage problems.**

UNDOUBTEDLY, many of you lightplane builders and flyers at one time or another were faced with a problem of where you were going to store your plane when not in use.

Of course, there is always an accommodation for your plane for storage at a commercial airport, but this is rather expensive and in some ways inconvenient. Therefore, to overcome these inconveniences and expenses, a small private hangar next to your home is the best bet.

Many of you have no doubt had the experience of traveling five or ten miles, or even greater distances, to get to your nearest airport. But, if a level tract of land is available in your neighborhood, or is part of your premises, a small inexpensive hangar such as illustrated here, could be erected and would prove a great time and moneysaver. The hangar is built rather solidly and should give long service. The adjoining room or office is another favorable feature for the amateur.

For the amateur who does not have too much money to spend, corrugated sheet metal will cut down the expense and also save time in construction. If this material is used, then uprights and cross-pieces must also be used. Before starting the actual construction, study the following supply list.

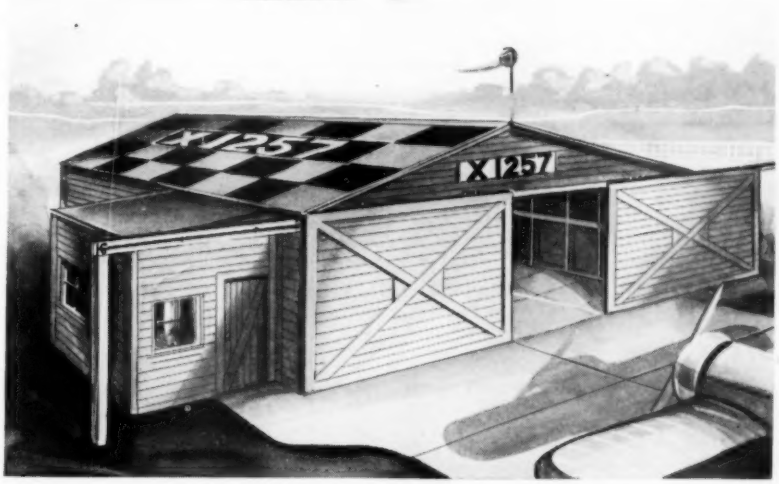
CONSTRUCTION

We will start the construction of this hangar by laying out the foundation. Lumber 4x4x30 is used. If 30-foot pieces cannot be obtained, 15-foot pieces may be used. Then the two pieces are joined together by cutting each piece 3 inches exactly in the center and cutting away the overhanging portion while the mate to this piece is being cut at the same time.

This joint is used only where joining the 4x4's and this particular piece corresponds for the middle end of the piece.

The corner posts and the roof foundation pieces are next installed followed by placing in the 2x4's until all are in their respective position. Spikes of about 5 or 6-inches are used in the various places. Rafters are from 2"x4" stock, shaped and placed in position. Roofing, side and floor laying is the next step and does not require explanation as it is quite simple.

The office may be built next. The rafters of the office roof rest on a 2x4 which is nailed in the slotted middle and corner posts of the hangar. As usual, first start the foundation and frame and then apply the 1"x10" side-boards on both the hangar and office. Nail on the clapboards, place in the windows, doors, etc. Tar roof paper is used on both the hangar and office.




**Here is the completed hangar as it will appear after the last nail is driven, with the old windsock, office, doors and everything complete.**

The door is our final step. It is made according to the plan and is installed on a track. Consult plans, supply list and picture for further reference. The minimum charge for the raw material should not exceed $250.

At this price, the hangar will pay for itself in a short time by savings in hangar rentals, at the usual rate. It is a trim neat looking little affair with nothing freakish about it and will prove a comfortable place to conduct repair jobs. Scaled drawings are hardly necessary, as the construction follows conventional practice in the arrangement of the rafters, studding, plates, etc.

## Bill of Materials

| Number | Size | Purpose | Board Feet |
|---|---|---|---|
| 41 | 2x 4x15′ | rafters, short pieces, uprights | 325 |
| 2 | 1x 4x15′ | middle rafter supports | 10 |
| 6 | 4x 4x 8′ | main uprights | 60 |
| 6 | 4x 4x30′ | foundation, also rafter foundation | 225 |
| 6 | 4x 4x15′ | floor | 120 |
| 72 | 2x10x15′ | foundation for clapboards | 1800 |
| 70 | 1x10x15′ | (inside wall) | 945 |
| 180 | 1x 4x15′ | roof | 900 |
| 92 (approx.) | 6″ wide 15′ | clapboards | ... |
| | | **OFFICE** | |
| 4 | 2x 4x 8½′ | rafter | 23 |
| 7 | 2x 4x15′ | rafter support, front and back uprights | 70 |
| 1 | 2x 4x10′2″ | rafter support | 9 or (7) |
| 3 | 2x 4x 7′1″ | side uprights | 14¼ |
| 2 | 2x 4x 6′ | short pieces | 8 |
| 2 | 4x 4x 8′6″ | foundation | 21¼ |
| 1 | 4x 4x10′2″ | foundation | 13 |
| 12 | 1x10x10′2″ | floor, side L | 101½ |
| 12 | 1x10x 9′ | sides | 90 |
| 26 | 1x 4x10′2″ | roof | 90 |
| | | **DOOR** | |
| 4 | 1x 8x14½′ | door frame | 38⅔ |
| 4 | 1x 8x 8′ | door frame | 21⅓ |
| 4 | 1x 8x15′ | door frame | 40 |
| 20 | 1x10x14½′ | door surface | 242 |
| | | Total, Bd. Ft. | 5165 |

MISCELLANEOUS

Roofing paper, 986½ sq. feet—each roll 100 ft.—10 rolls.
2 windows 2′10″x2′5″ sash —either plywood or wallboard.
60 ft. track for floor—2 hinges, nails, spikes.
Carriers for doors.

COPYRIGHT 1936
POPULAR AVIATION
JUNE, 1936

## . . . . and They Build Them In Honolulu

**Sgt. Taylor, his wife and son inspect the lightplane after its trial flight.**

ONE of the finest appearing lightplanes that we have yet seen, is the little ship built by Sergeant Truman P. Taylor, U. S. Army Air Corps, stationed at Honolulu, T. H.

The sergeant built the plane in the basement of his home in Honolulu, and it is said to have proved highly successful. The total cost, including the engine, was only $500, which is getting things down to a mighty economical basis.

While we have not much constructional data at hand, it is said to have a span of 20-feet and flies at a cruising speed of 70-m.p.h. So far, its ceiling has been 3,000 feet.

## A Steam Engine Starter for Planes
by CHARLES J. BAUER

ARMY engineers at Wright Field, Dayton, Ohio, have developed a combination steam generator and steam engine for cold weather starting of airplanes, capable of producing 80 pounds of pressure under all weather conditions within three minutes.

Water trickles into a copper coil, heated by a gasoline torch, and is converted instantaneously into steam. This passes through a flexible hose to a tiny four-cylinder V-type engine. The pressure is converted to revolutions and communicated to the inertia starter by means of an adapter. Eventually it is expected to build the tiny steam engine into the planes, if the device is accepted as standard.

The invention is intended primarily for cold weather operation of military planes. On the recent cold weather maneuvers of air force pilots in New England, various devices were tested for starting engines quickly at sub-zero temperatures. The similar portable gasoline motor in general use around airports was found almost as hard to start under those conditions as the airplane engines themselves.

One method used this year was to start the engines without oil and then to pour in the oil. In more general use was the practice of burning firepots under engine covers extending to the ground. The steam apparatus, developed too late for use in the recent maneuvers, may be used on a comparative basis with the other methods, or to supplement them, in the maneuvers next year.

The model stores two gallons of water, enough to provide steam for starting all planes of a squadron a whole day in the field. Already as light as the portable gasoline type, the steam device will be reduced in weight as refinements are made, W. E. Huffman the inventor said. It can be carried in an army transport or a bomber.

**The new steam engine and boiler used for starting the engines of military and transport planes. The engine is warmed and turned over.**

Another use being developed calls for a series of coils in airplane oil tanks.

## Air Corps Slanguage
by T. S. TERRILL

ARMY Air Corps Cadets at Randolph and Kelly Fields have developed a "language all their own" during the many years that the training center has been turning out service pilots. Some of the more printable of these expressions follow:

**DODO.** The name given to a new cadet entering Randolph Field. Derived from the imaginary Dodo Bird, the name sticks with him until he solos.

**RAUNCHY.** Used in place of "dirty" or "sloppy" such as "raunchy brass" or "a raunchy drill".

**WASHOUT.** To flunk out of the school, or to crack up a ship so badly that it can't be repaired.

**WASHING MACHINE.** The Stage Commander's ship. Washouts get the fatal check ride in it.

**BENZINE BOARD.** The Faculty Board at Randolph before which all "washouts" must appear to receive official notification of their elimination.

**PEASHOOTER.** A pursuit airplane or pilot.

**HIGH-SPY.** An observation pilot.

**BOOMER.** A Bombardment airplane or pilot.

**PUSH BUTTON PILOT.** A cadet who trains in one of the few PT-11's at Randolph. Most cadets train in PT-3's. These ships have shock-cords on the wheels, and consequently are hard to land only once for each take-off. The 11's have oleo shocks and are much smoother in the air. So, the PT-3 pilots maintain that these pilots fly by pushing buttons and letting the ship do the rest.

**HIGHPOCKETS** and **SANDBLOWERS.** The incoming class is divided into two halves, according to height. The tallest half lives in one set of barracks and bears the dignified title of Highpocket. The shorter half lives in another barracks, and its members are dubbed Sandblowers. According to the Highpockets, a Sandblower is a Cadet who is so short that when he sneezes, he blows sand in the eyes of the Highpockets.

**EAGER MISTER.** Any Dodo who is unusually energetic or ambitious.

**BAIL-OUT.** This is a parachute jump in any pilot's language, but at Randolph it has another application. It is a form of punishment inflicted by Upper class cadets upon the incoming dodos. If, during a meal, a dodo should displease his table commandant, he is ordered to "Bail Out". Whereupon, he pushes back his stool 'till it is well out of reach and then resumes the sitting posture with nothing but thin air for support. If he should continue to misbehave he will likely as not finish his meal under the table.

**SNAP TO!** This is an informal command to assume the position of attention.

**TAKE A BRACE!** This is another in-

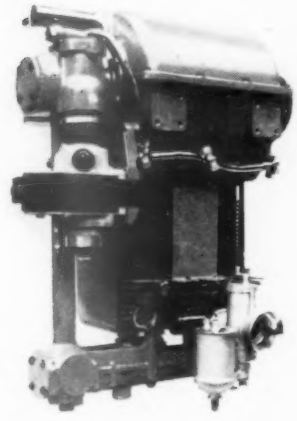
(*Concluded on page* 462)

## Aviation Menaced by Refineries

THE United States Hydrographic Office, ever on the alert to guard airmen, recently reported that natural gas in the air may constitute an aviation hazard.

The Hydrographic office issues frequent timely warnings on the conditions of airports and landing areas, new obstructions and the like. The report on natural gas was:

"Information has been received that gasoline plants in the Panhandle oil and gas field, located midway between Amarillo and Canadian . . . are liberating a great quantity of natural gas. It has been stated that many plants liberate as much as 10,000,000 cubic feet of gas per day. It is possible that the liberation of this gas into the atmosphere may create a condition which would result in an explosion caused by the exhaust of aircraft motors. It is probable that the hazard decreases with altitude."



The Train Model 2-T Two-cylinder lightplane engine.

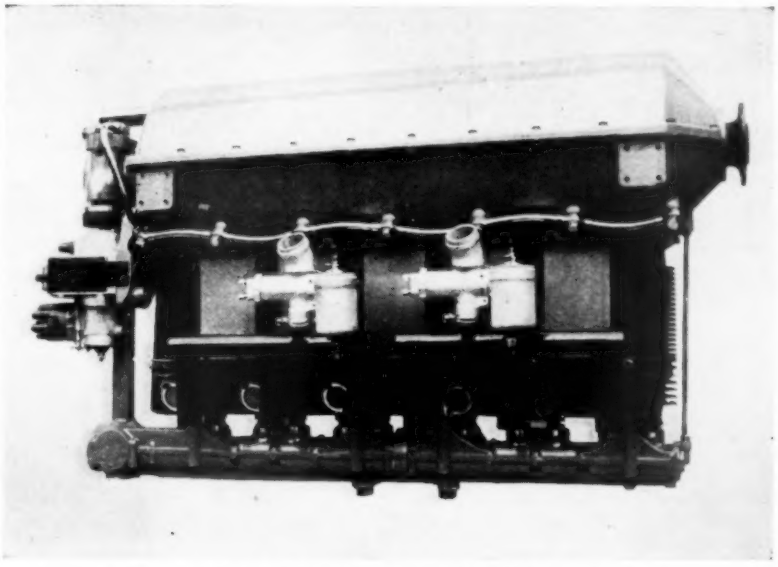
## Here You Are, Photo Phans

WE have had a very interesting communication from Real Photographs, 9 Union Court, Cook Street. Liverpool 2, England, in which they inform us of their extended business in airplane photographs.

This unique firm tells us that they have over 6,000 photograph collectors on their book who make photo collecting a hobby, and that they keep collectors in touch with one another through the medium of their correspondence club. The firm issues a booklet with a specimen post-card photo and list which they will be glad to mail upon the receipt of 8 cents, to any reader of POPULAR AVIATION.

In addition to airplane photographs, Real Photographs can also supply you with photos of railway trains, ocean liners, naval vessels, sailing ships, and so forth.

## Three New French Lightplane Engines



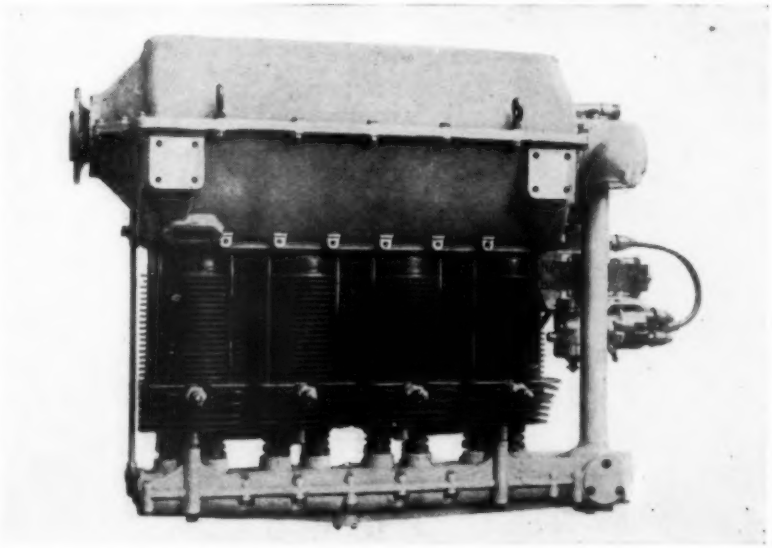
The Train Model 6-T in-line lightplane engine in its inverted position.

TRAIN, the well known French motorcycle engine manufacturer, has just produced three types of inverted air-cooled in-line engines for lightplane propulsion. These engines, as shown by the accompanying photographs, are compact light engines for the purpose intended.

First, is the Model 2-T, a two-cylinder engine developing 20-25 horsepower. The Train Model 4-T is a four-cylinder 40-50 horsepower engine, while the 6-T is a six-cylinder development rated at 60-70 horsepower. This covers the entire range of output with three models and with many of the parts common to all models.

The cylinders are the same for all three models, 80 mm. bore and 100 mm. stroke. The compression ratio is 6.00, and the maximum horsepower developed at 2,300 r.p.m. is 22, 44 and 66 horsepower for the 2-T, 4-T and 6-T models respectively.

It is claimed that the fuel consumption per horsepower-hour is 0.56 pint and that the oil consumption is 0.02 pint. The respective weights of the three models are 72-pounds, 102-pounds and 138-pounds.



A Train Model 4-T lightplane engine of the in-line air-cooled type is designed for inverted operation.

XUM

# Popular Aviation's Gas Model

by PAUL W. LINDBERG

**This is the first in a series of articles on the construction of a gas model airplane designed by Mr. Lindberg especially for the readers of POPULAR AVIATION. Many new features are incorporated in this model which will add to its popularity.**

FOR this first gas model design, I chose the Rearwin plane design for the reason that it lends itself very well to model gasoline engine propulsion. It can be made exceptionally stable in flight, is good looking and has pleasing lines and the shape of the nose is such that the cowling is easily made by the beginner, and this means a whole lot to the builder.

I wanted this model to look like a real plane rather than a modified "flying-stick," because when we get up to the construction of a gas job we should have something more to look at than just an assemblage of sticks with a motor mounted on the end of the sticks. This size model justifies the expenditure of more time and attention to detail than is commonly bestowed upon it. And when I first saw this model in the air, it looked so much like a real plane that I felt well satisfied with my decision.

My experience has taught me, that while flying ability is a prime requisite in a gas model, yet there are other practical points to consider in addition to flying ability. It must be simple to build, strong enough to withstand hard knocks and tough landings, must be easy to carry, and accessibility to the motor adjustments is a further item deserving attention. All of these points were carefully thought out in this model and I believe that, in the most part, that these objectives were achieved.

**Here's the Rearwin gas model in flying order, powered with a Baby Cyclone engine. This type is eminently adapted to gas propulsion as it is very stable in flight.**

**Easy to carry! This shows how the model folds up for transport.**

Anyone who has carried the unusual type of gas model out to the field will most certainly appreciate the factors of portability, carry-ability, mobility, or whatever you choose to call it. Anything more awkward than the ordinary model with fixed wings or even detachable wings is difficult to imagine. In the accompanying photo you will see how conveniently this little Rearwin model packs up and how easily it is carried. It can be placed in the rear compartment of a sedan and still leave room for passengers.

Next, in point of practical importance, is the extra long travel landing gear which is so effective and staunch that the model can be dropped from a height of several feet on a hard floor without damage to any of the parts. This is accounted for by the fact that the shock-absorbing mechanism has an exceptionally long travel, breaking the shock, and because the landing gear members are strong enough to take the impact. By looking at the accompanying drawing, you will see how the landing-gear struts are pivoted and supplied with heavy springs.

Another point that is of particular interest is the sheet-metal cowl which is a simple bending job without necessity for bumping or hammering out a difficult and intricately formed piece. This is usually a sticking point for the beginner and for this reason a lot of thought was put on the design of the sheet metal work.

Then, just under the hood you will find the power-plant including the engine and gasoline tank, the filler cap of the latter projecting through the top of the hood where it can be conveniently reached. Plenty of slack is left in the hose between the engine and the tank so that there will be no trouble with breakage. A wire from the spark plugs and wires from the timer run back to the spark-coil and batteries located in the middle of the fuselage, where they are more easily accessible and at a point where they balance the plane. The batteries and rack can be removed for inspection and adjustment through the bottom of the fuselage.

This particular plane is equipped with a Baby Cyclone engine which provides a perfectly satisfactory source of power, but other engines can be used if changes in the mounting, center of gravity distance and weight are compensated for. Changes in unbalance can also be taken care of by moving the ignition units back and forth as previously suggested.

A very simple and substantial motor-mount has been devised, that is shown in full detail in the accompanying drawing. Briefly, this consists of a piece of sheet aluminum or dural cut to the outline shown and then folded up into a "U" form part that bolts up or is screwed to the three-ply veneer bulkhead or fire-wall.

The attachment of the fuselage longerons to the three-ply fire-wall is a simple job, and after this is in place, the aluminum motor mount can be located and fastened into place on the fire-wall, making the location or readjustment of position a very simple and easy matter.

The inversion of the motor may be attended by some minor difficulties and minor readjustments, but this matter will be taken up in a subsequent issue.

We must also take into account, the location of the motor controls so that the engine can be easily started and regulated without unduly opening the access ports or hood during this rather critical moment.

In general, there is not a great deal of structural difference between the fuselage of this model and that of the rubber model except that the members of the model are necessarily larger and much stronger to take the extra stresses due to the greater wing-span, heavier loading and higher speeds. All of the fuselage members are of balsa with the exception of the plywood firewall detailed on the legs or struts of the landing gear which are of basswood.

In the lower right-hand corner is a detail of the fixed stabilizer and elevator and just above this tail detail is a detail of the tail-skid, its spring and method of connection. Note that the outline of the tail is very much stronger and stiffer than that ordinarily used with a rubber-driven model because of the higher speed and rougher landing shocks that result from the higher speeds.

At the bottom of the drawing will be found a perspective sketch of the torque bracing or cross-bracing in the fuselage necessary for the support of the landing-gear shock-absorbing members. It is imperative that the fuselage be well braced at this point and in every direction to take up the shocks which are often very severe. The landing-gear wheel is turned up from solid balsa to avoid expense, but of course, a regular tire and wheel can be used if desired.

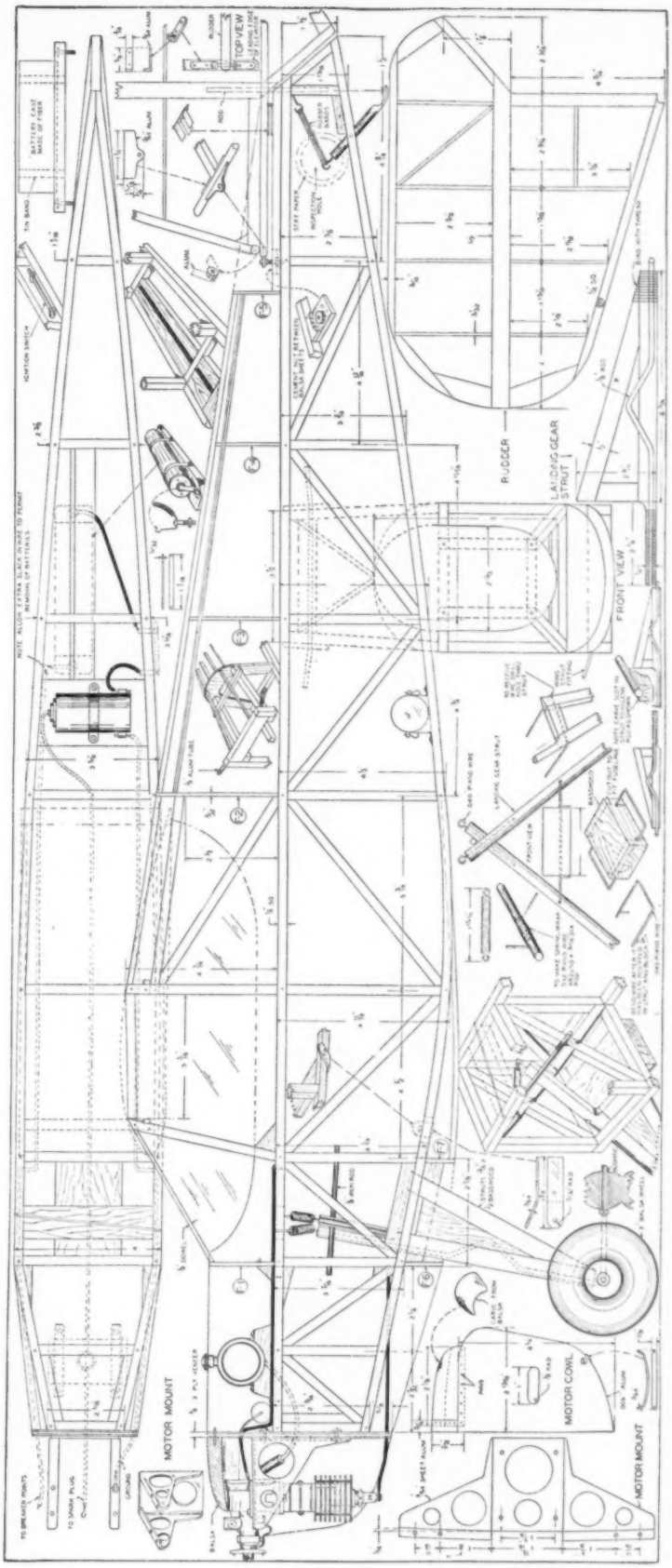
The top longeron is straight and the contour of the upper portion of the body is carried out by light fairing strips running across the formers as indicated. This extends to the cabin where the transparent windows and cabin covering are supported by ⅛" dowels as shown. It should be noted that the entire load is supported from the wing through the cabin formers and, therefore, fairly heavy balsa is used at this point.

Both the elevator and rudder must be adjustable for the proper control in flight. The method of adjusting the elevator is shown on the top and at the rear end of the fuselage, the adjustment being made by a screw in an imbedded nut set between two sheets of balsa. A similar arrangement is made for the adjustment of the rudder and when these two adjustments are made they automatically lock into position without danger of working loose.

The test flights recently carried out at Sky Harbor, near Chicago, showed this little ship to possess an unusual degree of stability without the least tendency to roll or pitch. It took off within 50 feet and climbed rapidly in a manner identical with that of a large plane. There was no apparent torque effect, due to the correct distribution of the surfaces at any stage of the flight.

In our next issue, we will describe further fuselage details and then take up the construction of the wings. The wings require much attention for they must not only be light but also very strong.

*(To be continued in July issue)*



# Flying Gas Models 'Way Out West

BABY CYCLONE model airplane engines are sure pushing the models over the winning line, out in California and elsewhere. Mel Anderson flew a Baby Cyclone powered "Chieftain" to first place in the 1936 San Diego Meet, San Diego, Calif., while second and fourth places were also held by Baby Cyclone powered craft. Anderson's time was 13 minutes, 51 seconds on less than one-third ounce of gas.

And now, as a result of numerous tests, Aircraft Industries, are bringing out a new model of the baby engine known as the Baby Cyclone Model "B". This new model has many new and improved features, among which are greater fuel economy, greater ease of operation and longer life. This is the third model to be presented to model builders, the former engines being "X" and "A".

The improved results in the new engine are due largely to improved materials and slight changes in the design that are not in evidence at first glance. There have been no radical improvements and the engine, as a whole, remains essentially as before. The attached pictures show the Aircraft Industries' "Chieftain" with its "pilot," Mel Anderson, who is production superintendent at the Aircraft Industries Plant.

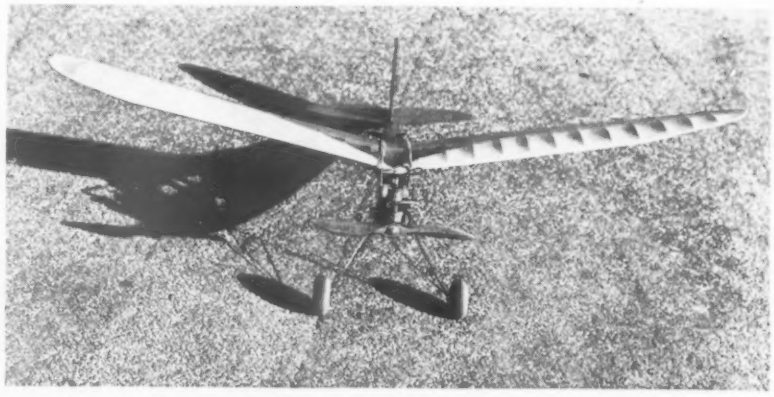
Anderson overcame many of the difficulties heretofore experienced with low-wing gas models by employing a low center of gravity and using a polyhedral wing. The "Chieftain" weighs 2 pounds, 10 ounces complete and has a wing-span of 66 inches.

To make matters still more interesting, Major C. C. Mosely, World War flyer and winner of the first International Pulitzer race, is furthering the cause of gas-model aviation by offering $200 in cash to the winners of the National, providing that the winning planes are powered with Baby Cyclone engines. This is a prize well worth winning, you betcha.

A special feature well worth mentioning is the "Firecracker" spark coil employed with the Baby Cyclone that gives an intensely hot flame and thus adds to the power and the certainty of the ignition. A weak spark-coil with an engine having a high compression is almost a certain cause of trouble.

The National contests are to be held June 30 to July 2, of this year and it will be well to start your model well in advance of these dates in order to get an opportunity for testing and adjusting the model so that no uncertainties will stand in your way at the time of the meet.

This contest is divided into two sections; one for boys of 16 to 21 years of age and one division for contestants 21 years of age or older. A winner in both divisions draws a prize of $100, or a total of $200 in both divisions.



**The Aircraft Industries' "Chieftain", an outstanding model powered by a Baby Cyclone engine.**

**Mel Anderson with his Baby Cyclone powered winner.**

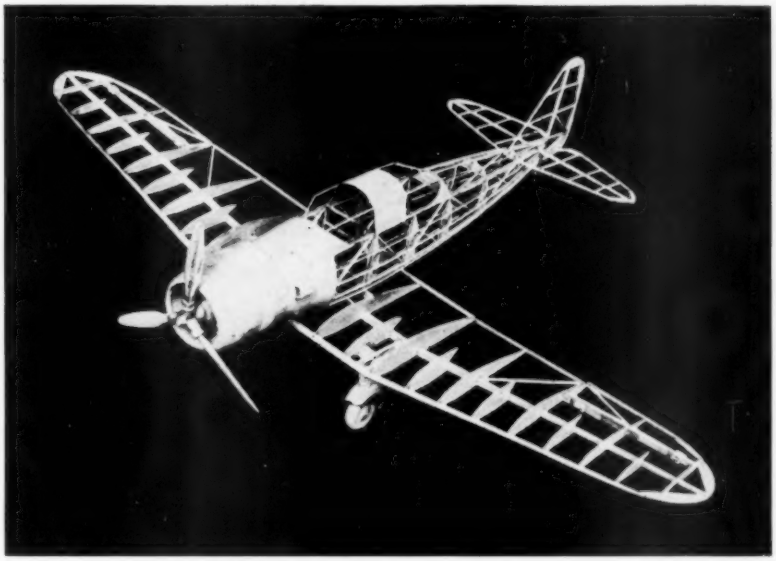
**Here is another view of the "Chieftain" with its Baby Cyclone power plant.**

# Building the Northrop Attack

by

PAUL W. LINDBERG

Model Editor and
Model Designer for
POPULAR AVIATION.



This is the frame-work of the Northrop Attack plane, one of the outstanding military planes used by the U. S. Army Air Corps.

OUR model for this month is the latest Army attack ship. The Northrop with its distinctive markings and fine detail is an interesting and attractive decoration. Test flights also indicate that it is an excellent flyer. Do not attempt to build this model in too short a time for the beauty of the model depends on good workmanship and patience.

## COLOR SCHEME

Fuselage and landing gears are new Army blue. Wings and tail surfaces are Army yellow. Details are silver, black and white.

## CONSTRUCTION OF FUSELAGE

It is necessary to place a sheet of ordinary wax paper over the plan to prevent cement from sticking to the plan. Now you are ready to build the fuselage, which is constructed one side at a time. The longerons, vertical and diagonal braces, etc., are held in place until securely cemented. This is done by inserting straight pins on either side of strips.

When fuselage sides are completed, they are pinned to top view of the plan in such a manner that the top longerons face down and the sides are at right angles with the table. The cross-members are now cemented in place, forming a rectangular fuselage.

Cut formers from 1/32-inch sheet balsa and cement in their respective positions as shown on plan. Balsa nose plate is built up from ⅛ sheet balsa.

## CONSTRUCTION OF MOTOR

The cylinders are carved and sanded from balsa blocks. When fourteen cylinders have been formed to represent fins, wind heavy thread around them. Make crankcase from two pieces of balsa. Rocker arm housings, push rods and other small details of the motor are also made of balsa.

The completed Northrop Attack plane model is an attractive ultra-modern design that you will be proud to own.

## CONSTRUCTION OF WING

This wing is made up of three separate panels. Cut all ribs from 1/16-inch balsa. Pin the spar in position on the plan. Now, cement ribs in their proper locations. The leading and trailing edges are cut and sanded to shape and cemented to the ribs. The panels carry movable ailerons which are a great help in controlling the flights. Make wing tips from 1/16-inch thick balsa. We highly approve of this type of wing tip because it is much easier to construct and is also neater in appearance.

## CONSTRUCTION OF ELEVATOR AND RUDDER

These are built from 1/16-inch square and flat balsa and are constructed on the plan. Their construction is very simple and no trouble should occur here.

## CONSTRUCTION OF LANDING GEARS

The construction of landing gears is clearly shown on the plan.

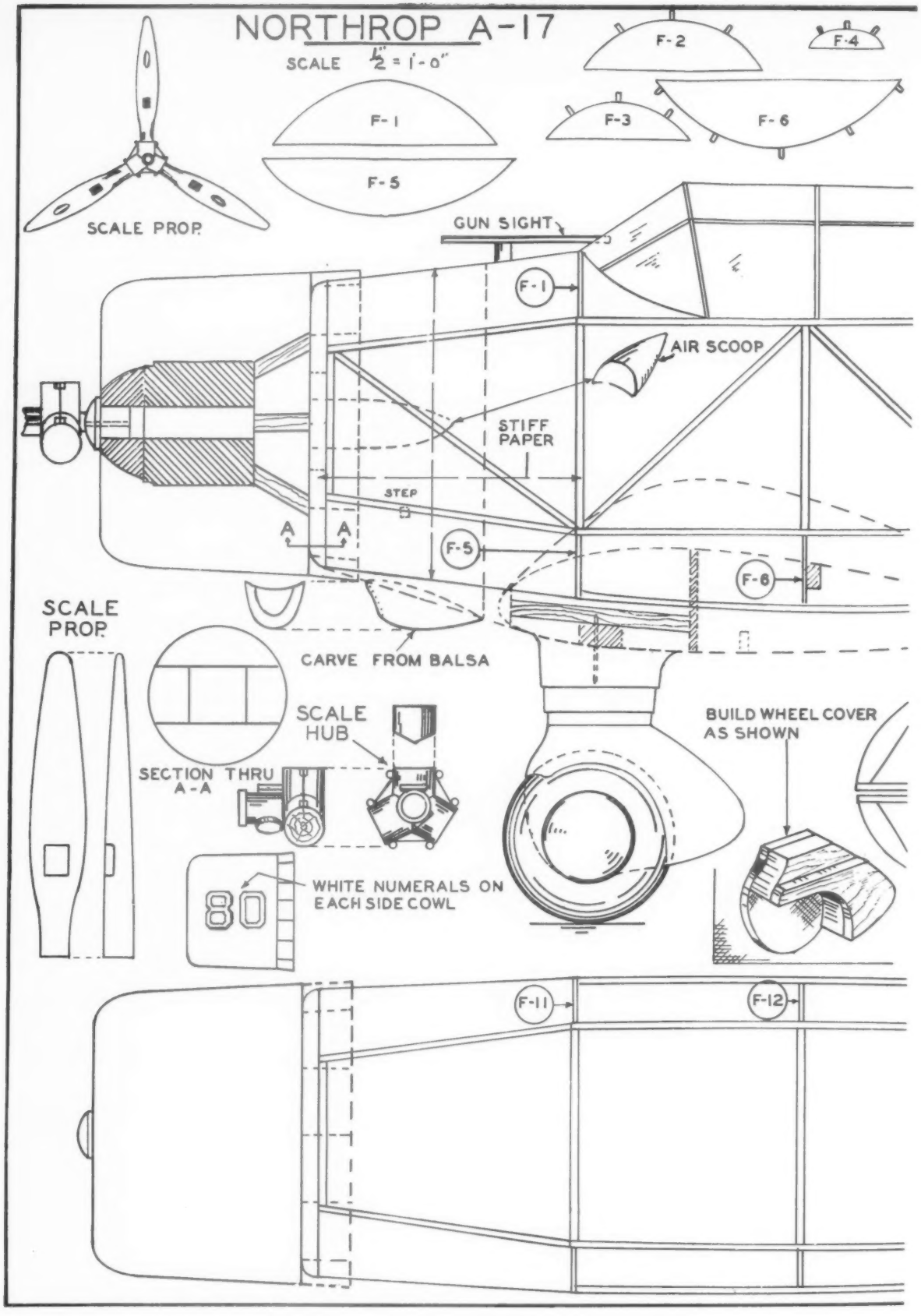
## COVERING THE MODEL

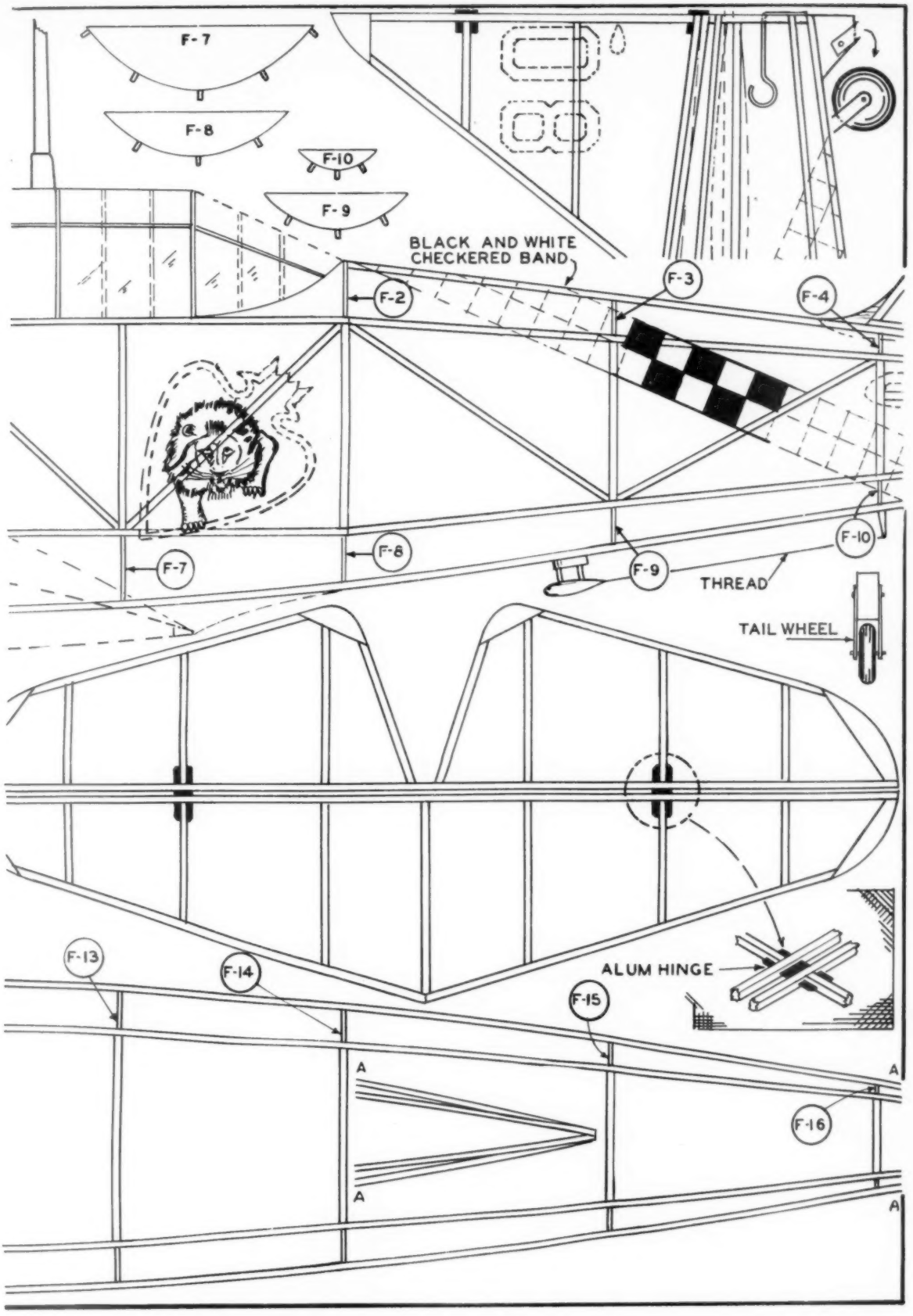
Apply tissue to the various framework members, using a light grade model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such to flat surface to prevent warping.

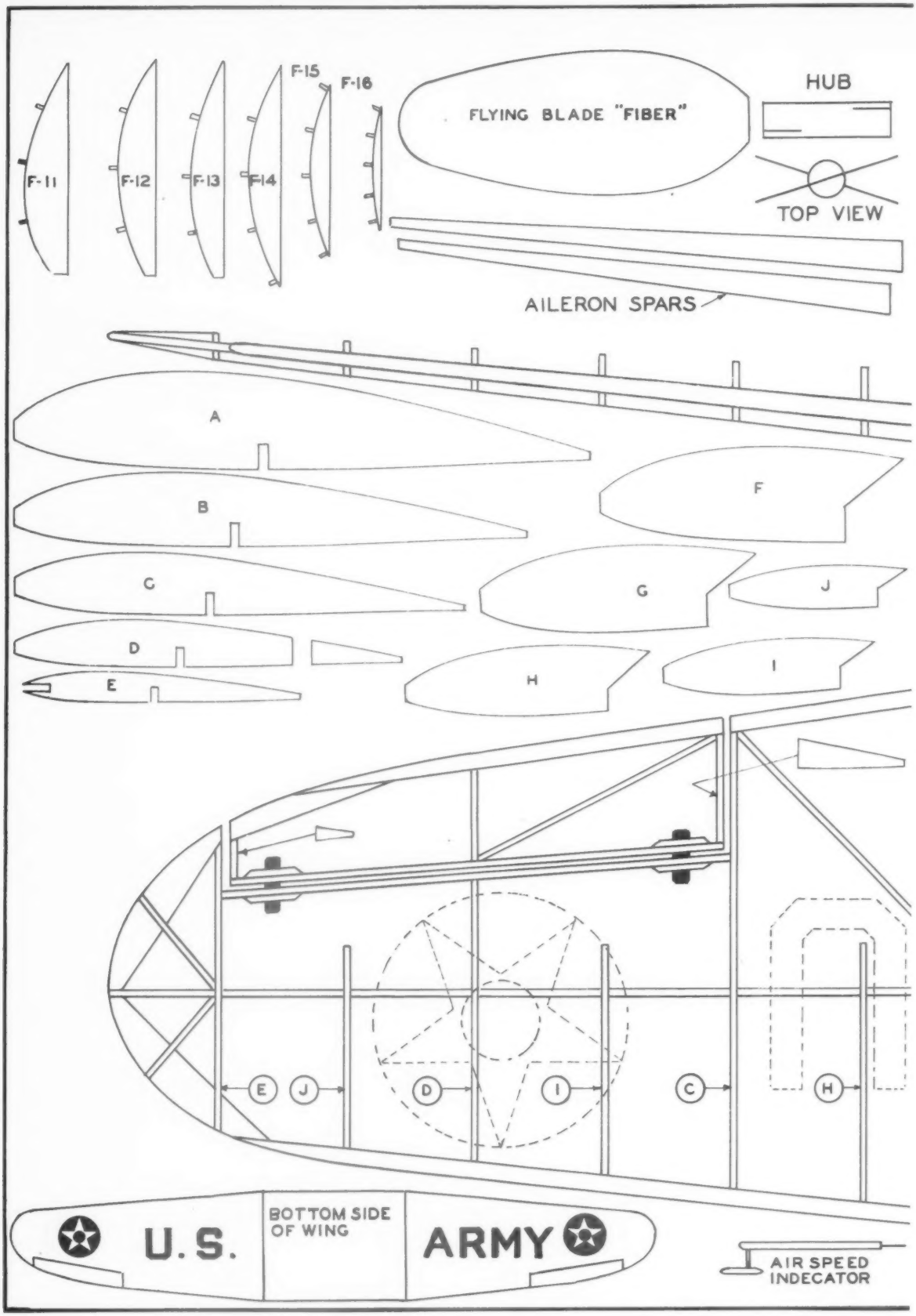
## ASSEMBLY

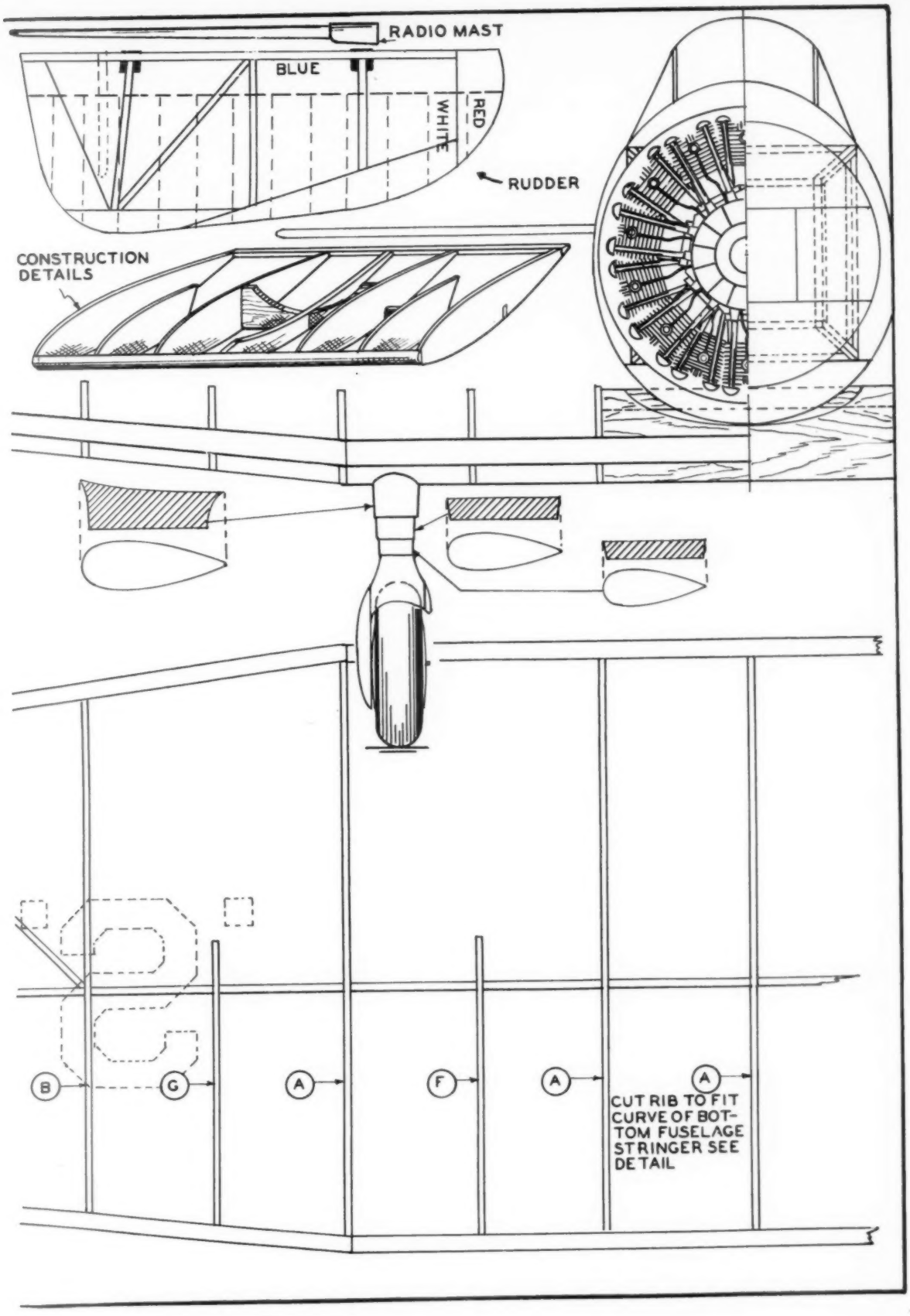
After the wing panels have been cemented to fuselage, make fillets from paper and fill in open spaces between fuselage and wing panels at trailing edges. Other small details are clearly shown on the plan.

(*Concluded on page* 458)


NORTHROP A-17
SCALE 1/2" = 1'-0"
F-1
F-2
F-3
F-4
F-5
F-6
SCALE PROP.
GUN SIGHT
AIR SCOOP
STIFF PAPER
STEP
A
A
CARVE FROM BALSA
SCALE HUB
SECTION THRU A-A
BUILD WHEEL COVER AS SHOWN
80
WHITE NUMERALS ON EACH SIDE COWL
F-11
F-12


F-7
F-8
F-10
F-9
BLACK AND WHITE
CHECKERED BAND
F-2
F-3
F-4
F-7
F-8
F-9
F-10
THREAD
TAIL WHEEL
F-13
F-14
F-15
ALUM HINGE
F-16
A
A
A
A


F-11
F-12
F-13
F-14
F-15
F-16
FLYING BLADE "FIBER"
HUB
TOP VIEW
AILERON SPARS
A
B
C
D
E
F
G
H
I
J
E
J
D
I
C
H
U.S.
BOTTOM SIDE OF WING
ARMY
AIR SPEED INDECATOR


RADIO MAST
BLUE
WHITE
RED
RUDDER
CONSTRUCTION DETAILS
B
G
A
F
A
A
CUT RIB TO FIT CURVE OF BOT-TOM FUSELAGE STRINGER SEE DETAIL

# U. S. ARMY AIR CORPS

By E. Stanton Brown

**By popular request twenty additional insignia are shown on the back cover. These, as well as the preceding eighty insignia, are presented in their true and authentic colors, checked and approved at official sources. Following is a description of the organization and activities of the various squadrons shown.**

Pursuit planes are mostly fast maneuverable single-seaters and, of late, include two-seater ships Rugged, swift climbing, powerfully armed with .30 and .50 caliber machine guns and small bombs, their duty is to sweep enemy aircraft from the skies and to form protective convoys for slower, less maneuverable planes.

The 20th Pursuit Group was reconstituted at Mather Field in November, 1930. Its present components are: Headquarters, 55th, 77th and 79th Pursuit Squadrons. The Group is now located at Barksdale Field, Shreveport, La.

The 79th Pursuit Sq. was constituted on the inactive list in 1927 first as the 79th Observation Sq. It was redesignated as a Pursuit Squadron in 1929 and became active in 1933 at Barksdale Field, its present location. The old 79th Aero Sq., which was originally organized at Camp Waco, Texas in 1918 and demobilized later that same year, was reconstituted and consolidated with the present squadron. This unit did not serve overseas. The squadron is now equipped with Boeing P-26 pursuit ships.

Also born as an observation squadron, the 77th Pursuit Squadron was redesignated as such in 1929, having been constituted on the inactive list in 1927. It was made active at Mather Field in 1930 and was transferred to Barksdale Field, its present station in 1932. This squadron is also equipped with Boeing P-26 pursuit ships.

Organized at Kelly Field in 1917, the 43rd Pursuit Sq., then known as the 43rd Aero Sq. (Service), served overseas first in England and then in France during the latter part of U. S. participation in the war. After the war it was demobilized and then in 1924 was reconstituted and consolidated with the two-year-old 43rd School Sq. In 1935 it was redesignated 43rd Pursuit Sq. at Kelly Field. The unit is now equipped with Boeing P-12 pursuit ships.

## OBSERVATION

The duty of observation squadrons is to gather information concerning enemy movements, both by observation and photography. They also cooperate with the artillery in spotting the effectiveness of fire, correcting the range by radio.

The 16th Observation Sq. was organized in Chicago in 1916. After several shifts about the country it finally went overseas in December, 1917. It was attached to the 2nd Aviation Instruction Center for the duration of the war and returned to this country in May, 1919 when it was demobilized. The present squadron was organized at Ft. Riley, Kansas, in 1921 and in 1924 the war time organization was reconstituted and combined with the 16th Observation Sq. It was immediately expanded into five flights which are located as follows: Flight A—Langley Field; Flight B—Ft. Benning, Ga.; Flight C—Ft. Bragg, N. C.; Flight D—Ft. Riley, Kansas; Flight E—Ft. Sill, Oklahoma. All flights are equipped with Douglas O-25 observation planes.

The 39th Aero Sq. was organized at Kelly Field in 1917. It did not serve overseas and was demobilized in 1919. In 1933 it was reconstituted and combined with the 39th School Sq., which was made active in 1927 at Kelly Field. The unit was redesignated 39th Observation Sq. in 1935 and is still at Kelly Field. The squadron is now equipped with Thomas-Morse O-19 and Douglas O-25 Observation planes.

The 41st Observation Sq. was organized as the 41st Aero Sq. at San Antonio in 1917. It served overseas, but was not engaged in combat. Demobilized in 1919, it was reconstituted and consolidated with the 41st School Sq., which had been organized in 1922. The unit was redesignated the 41st Observation Sq. in 1935. Thomas-Morse O-19 observation planes are the squadron's present machines.

The National Guard observation squadrons located in each of 19 states form a strong nucleus for immediate training in case of national emergency.

The 105th Observation Sq., N. G., claims the distinction of being the first organized National Guard Air Unit in the United States. It was formed by a group of World War flyers and others interested in military aviation directly after the war. Two years later it received Federal recognition, in 1921. The squadron is now located at Murfreesboro, Tenn., though it was organized at Nashville. Its present equipment is the Douglas O-25A observation plane.

The 110th Observation Sq., N. G., was organized at Anglum, Mo., in 1923. Now located at Robertson, Mo., it is equipped with Douglas BT-1, O-38B and O-38E observation planes.

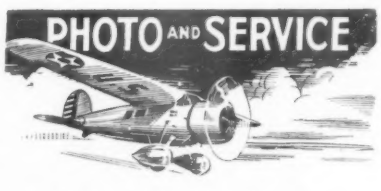
The 111th Observation Sq., N. G., was organized at Houston, Texas, in 1923. It is now equipped with Douglas O-43A observation planes.

The 112th Observation Sq., N. G., was organized in Cleveland in 1927. This squadron is equipped with Douglas O-38 and O-38B observation planes.

The 116th Observation Sq., N. G., was organized at Parkwater, Washington, in 1924. Douglas O-38, O-38B and O-38E observation planes comprise its equipment.

The 118th Observation Sq., N. G., was organized at Hartford, Conn., in 1923. It is equipped with the Douglas O-38E observation plane.

The 154th Observation Sq., N. G., was organized at Little Rock, Ark., in 1925. It is equipped with the Douglas O-38 type observation plane




An air force would be seriously handicapped without the highly organized, excellently equipped and efficient photo sections, which can literally bring pieces of the theatre of war back to the commanding officers to study and so direct their future activities.

The 2nd Photo Section was formed in May, 1918, at Amanty, France, and was assigned to the 91st Aero Sq. It later served with the 1st Observation Sq. It was reorganized in 1920 after being demobilized after the war and was sent to Kelly Field. In 1922 it was moved to Langley Field.

The 23rd Photo Section was organized in New York in 1918. It served overseas but did not engage in combat. A new 23rd Photo Section was formed at Post Field, Okla., in 1922, the old unit having been demobilized in 1919. In 1924 the 23rd Photo Section of the World War was reconstituted and consolidated with the new organization. Transferred to March Field in 1927.

## SERVICE

Service squadrons are equipped with cargo planes for the transfer of supplies and field personnel. They are the fellows who keep the planes in the air.

The 71st Service Sq. was organized in February, 1918, at the Aviation Camp, Waco, Texas, as the 1st Aero Service Sq. It was transferred to Love Field at Dallas and consolidated with other squadrons to form Flying School Detachment. The unit did not serve overseas and is now located at Barksdale Field.

The 68th Service Sq. was organized at Kelly Field in 1922 as Air Park No. 13. It was changed to a Service Squadron three months later The squadron is still located at Kelly Field.

The 58th Service Sq. was organized as the 3rd Air Park Company in February, 1918. It served overseas from June, 1918, until June, 1919, and participated in the following operations: Defensive Sector (Lorraine), St. Mihiel and Meuse-Argonne. It was demobilized in July, 1919, and was reconstituted and consolidated with the 58th Service Sq., which was organized in 1921. The unit was transferred to Langley Field in 1932.

The 59th Service Sq. was organized at Kelly Field as the 52nd Aero Provisional Sq. in 1917. At the signing of the Armistice the squadron was located at Chatenay, which was the nearest location attained to the Front Lines, distance being approximately 70 kilometers. It was stationed at Langley Field in 1922.

END

# SELLEY-TEX sets an utterly NEW STANDARD OF VALUE!

Reg. U. S. Pat. App. For

**Read why novices as well as experts change to "MOULDED CONSTRUCTION"*

## Full-Money-Back-Guarantee Certificate in every Selley Kit!

Model builders who could never successfully build All-Balsa-Stick-Kits are switching fast to SELLEY-TEX Construction Sets and write in to say *"The easiest and most practical way to assemble flying model planes on the market!" "This is the first airplane I ever was able to build and actually fly thanks to your clever idea of 'moulded parts'." "At last here is a simple kit that the average fellow can appreciate." Without exception they agree that this revolutionary method of simplified building is the greatest advance in the history of model kits. We want *you* to share their enthusiasm—to find out for yourself why we invested thousands of dollars in modern machinery and equipment so that you would enjoy a new thrill in model building and flying. Yes, SELLEY-TEX offers more for your money than old-fashioned All-Balsa-Stick-Kits. Choose any one of the "star" model SELLEY-TEX Construction Sets and learn for yourself the many and extraordinary advantages these exclusive kits have over any type you've ever tried. Read the excerpts from letters of praise and recommendation shown on this page. We welcome your comments, too. Please tell us of YOUR experience with SELLEY-TEX. We'll appreciate it. See the coupon below and ACT NOW!

### THANK YOU MR. REARWIN!

**REARWIN AIRPLANES, INC.**
**FAIRFAX AIRPORT, KANSAS CITY**

Gentlemen: One of our men set up the SELLEY-TEX Rearwin Speedster. He has built a great many models using both kits and blueprints, and says that the moulded forms for fuselage, pants, motor, etc., are exceedingly easy with which to work. I am keeping this model on my desk and everyone who comes in admires it greatly. It certainly is realistic looking.

*(Signed)* KENNETH REARWIN.

*"I had a lot of fun building the Vought Corsair Jr. model and made a profit, too. I sold the finished job to a friend for $3.75. SELLEY-TEX kits for me from now on!"

1.25 15c Postage

Wing Span, 18"
Length ....13¾"

VOUGHT CORSAIR, JR.

This latest formidable looking military plane complete with guns, bombs, etc., is built for stamina and designed for speed.

*"I didn't think it believable that I could actually build and fly a model plane until I tried the Bellanca Swoop. Especially after many failures with all wood kits."

1.00 15c Postage

Wing Span, 20"
Length ....11½"

BELLANCA SWOOP

A perfect authentic reproduction of this famous London to Melbourne racer.

*"The Rearwin Speedster kit I constructed looks like a prize contest winner to me. I think SELLEY-TEX is the greatest bargain ever offered on the market."

75c 15c Postage

Wing Span, 16"
Length.....10"

REARWIN SPEEDSTER

Simple to build and realistic in all details! A great flyer too! Wonderful Value!

*"I just finished building your Monocoupe and want to say it has exceeded my greatest expectations. I'll never go back to the all wooden kits again."

1.25 15c Postage

Wing Span, 20"
Length ....12½"

MONOCOUPE

A beautiful miniature of the popular original and what a flyer!

*"After my friends showed me the easy SELLEY-TEX method of building the difficult parts of a model, I decided to discard the old way and have built your Lockheed Orion for our annual Hobby Show."

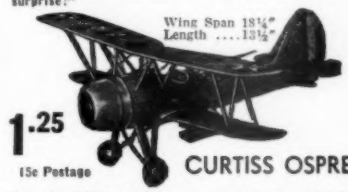
Wing Span, 20"
Length ....12¾"

1.25 15c Postage

LOCKHEED ORION

An amazing realistic replica of this famous transport.

*"My easy success with your Curtiss Osprey leads me to strongly recommend the clever moulded method of construction and hope that others who have not tried SELLEY-TEX, will do so. They're in for a pleasant surprise!"



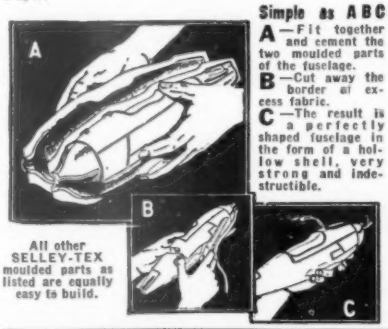
Wing Span 18¼"
Length ....13½"

1.25 15c Postage

CURTISS OSPREY

Exceptional flight performance, authentic beyond belief. Full military equipment, guns, bombs, etc., for realism.

**Each of the SELLEY-TEX Construction Sets contain the necessary individually designed moulded scale parts similar to those shown below.**




**Simple as ABC**

**A**—Fit together and cement the two moulded parts of the fuselage.

**B**—Cut away the border of excess fabric.

**C**—The result is a perfectly shaped fuselage in the form of a hollow shell, very strong and indestructible.

All other SELLEY-TEX moulded parts as listed are equally easy to build.

### 10 REASONS MODEL BUILDERS SWITCH TO SELLEY-TEX

*The Modern Method of Model Building!*

★ **MOULDED CONSTRUCTION.** First real advancement in practical model airplane building. The production investment exceeds the cost of most of the All-Balsa-Stick-Kit manufacturers combined!

★ **EXCLUSIVE FABRIC.** Specially close woven and processed by secret formula. The smooth moulded surface can be beautifully finished in any color combinations with dope or lacquer.

★ **EASIER-TO-BUILD.** The moulded parts make it simple as A B C. Novices as well as experts easily and successfully build and fly planes this new simple way.

★ **MORE PRACTICAL.** Selley is discontinuing All-Balsa-Stick type of kit entirely. An analysis showed that less than 2% of those who try, can actually complete an All-Balsa-Stick-Kit!

★ **MORE AUTHENTICALLY DESIGNED.** Minute details are moulded into model. Each is an exact, true-to-scale miniature of the original plane perfect in every detail.

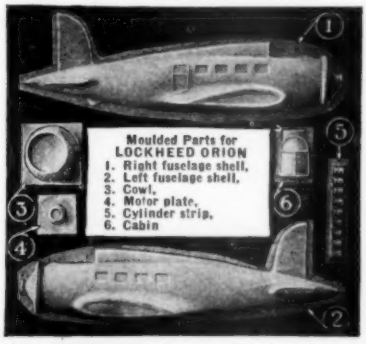
★ **MORE DURABLE.** The moulded fabric shells are stronger though lighter. They will not warp, tear or puncture and are practically crash-proof and unbreakable.

★ **BETTER FLYERS.** The moulded fuselage eliminates weight behind center of gravity which is approximately 95% perfect in all models assuring better flying performance.

★ **POSITIVE MEANS OF BALANCING.** Simple ring device correctly balances plane. A new clever feature found only in these moulded models.

★ **PATENT APPLIED FOR.** The moulded process is an original creation owned exclusively by Selley.

★ **MONEY-BACK GUARANTEE.** A full protection money back guarantee certificate is included in every kit!




**PARTS AND ACCESSORIES**

Every SELLEY-TEX model is packed in a beautiful, sturdy box with semi-finished flying or scale propeller, formed wire hooks, scaled wheels, with brass bushings, ribs printed out accurately on white sheet balsa, many special turned wood parts, fine-t grade of balsa wood sticks, tail wheel and fork fittings, and wire, pure para rubber, colored paper, authentic markings, colored insignia, best quality cement, colored dopes and full-size easy-to-understand plan.

**FREE!** Write for our new beautiful, two-colored broadside illustrating in detail the new line of incomparable lower price SELLEY-TEX Construction Sets. Send 3c stamp for postage.

A brand new supply catalogue picturing and listing the most popular plane accessories is yours for the asking. Send 3c for postage.

Try your Sporting Dept. store or local dealer first. Use coupon if you can't get SELLEY-TEX. Please mention your dealer's name and address.

Please send me the SELLEY-TEX model kits I have checked. I am enclosing $..... (check or money order). (Each plane 15c postage. West of Denver 25c postage.)

| | | | |
|---|---|---|---|
| MONOCOUPE | $1.25 ☐ | REARWIN | $ .75 ☐ |
| VOUGHT CORSAIR | 1.25 ☐ | BELLANCA SWOOP | 1.00 ☐ |
| LOCKHEED ORION | 1.25 ☐ | CURTISS OSPREY | 1.25 ☐ |

PRINT NAME .....
ADDRESS .....
CITY AND STATE.....
DEALER'S NAME .....

MASS. INSTITUTE OF TECHNOLOGY LIBRARY

**SELLEY MFG CO. INC., DEPT 406 B 1373 GATES AVENUE, BROOKLYN, N. Y.**

**JOBBERS! DEALERS! DISTRIBUTORS:**

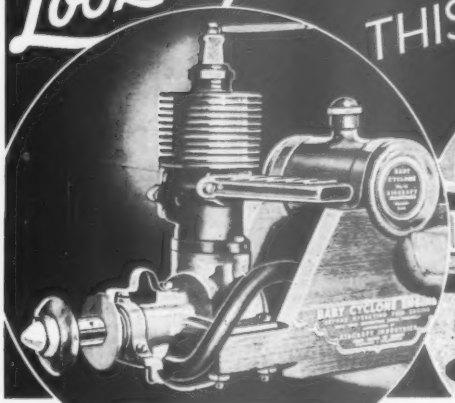
IT WILL PAY TO WRITE FOR INFORMATION ABOUT SELLEY'S NEW SALES PROGRAM!

- Exclusive Territorial Franchises
- Special Introductory Sales Guarantee
- Profit Sharing Competitive Discounts
- National Advertising Sales Tie-Up
- Cash and Prize Contest Promotions
- Striking Displays and Dealer Helps

BUILD A BIG REPEAT-BUSINESS WITH THESE EASY-TO-BUILD, SELL-ON-SIGHT SENSATIONS!

XUM

# Look! Special Offer THIS COMPLETE OUTFIT for ~~$25.15~~ $21.50



**THIS OFFER POSITIVELY EXPIRES JUNE 15**

This is the offer of a lifetime—Anyone buying the famous "Baby Cyclone" engine during this period can secure the "California Chief" Kit and propeller at a special combination price of $5.75—a total of only $21.50 for everything. There is nothing else to buy—yet the price is what you have to pay for a bare engine elsewhere. • But Hurry! Such a sensational offer can't last. Unless your order is post marked before midnight June 15, 1936, we cannot supply you. Remember the deadline. Play safe, send coupon today!

Aircraft Industries, Major C. C. Moseley, Pres.
Grand Central Airport, Glendale, California

As advertised, send me your complete outfit of engine at $15.75 together with kit and propeller at special price $5.75 for which I enclose P. O. money order for $21.50. I understand this offer positively expires June 15, 1936. P

Name_____

Address_____

☐ Engine only $15.75 ☐ Kit only $7.90

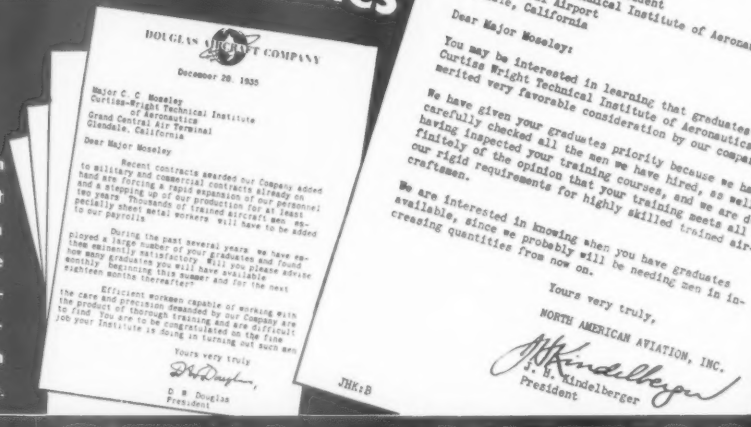
☐ Propeller only $1.50

**THIS IS WHAT YOU GET**

1. "Baby Cyclone" Engine complete including gas tank, coil, timer and condenser, mounted on wooden base after actual run-in test ready to install in the completed kit. Speed from 500 to 4000 R.P.M., develops 1/6 H.P. Runs 17 to 20 minutes on one oz. of gas. Weight complete 10½ oz. Backed by a responsible organization.
2. "California Chief" Kit, specially designed for "Baby Cyclone" engines—5 ft. wing span, assembled landing gear with 3½" air wheels, cut-to-shape fuselage, tail surfaces and ribs, silk for covering, dope, glue, etc., and full size plan instructions.
3. Special 13" hi-polish hardwood propeller engineered for the "Baby Cyclone" to develop maximum horsepower.

ORDER DIRECT OR THROUGH YOUR DEALER

# Now.. Another Great Aircraft Plant Demands our Graduates



DOUGLAS AIRCRAFT COMPANY

December 20, 1935

Major C. C. Moseley
Curtiss-Wright Technical Institute
of Aeronautics
Grand Central Air Terminal
Glendale, California

Dear Major Moseley

Recent contracts awarded our Company added to military and commercial contracts already on hand are forcing a rapid expansion of our personnel and a stepping up of our production for at least two years. Thousands of trained aircraft men especially sheet metal workers will have to be added to our payrolls

During the past several years, we have employed a large number of your graduates and found them eminently satisfactory. Will you please advise how many graduates you will have available monthly beginning this summer and for the next eighteen months thereafter?

Efficient workmen capable of working with the care and precision demanded by our Company are the product of thorough training and are difficult to find. You are to be congratulated on the fine job your Institute is doing in turning out such men.

Yours very truly

D. W. Douglas
President

Curtiss-Wright trained men don't have to worry about employment. They are in demand. You, too, can take advantage of this big opportunity in aviation by training at Curtiss-Wright Tech in the heart of the industry.

NORTH AMERICAN AVIATION, INC.
ENGINEERING AND EXPERIMENTAL DIVISION
LOS ANGELES MUNICIPAL AIRPORT
INGLEWOOD, CALIFORNIA

March 18, 1936

Major C. C. Moseley, President
Curtiss Wright Technical Institute of Aeronautics
Grand Central Airport
Glendale, California

Dear Major Moseley:

You may be interested in learning that graduates of the Curtiss Wright Technical Institute of Aeronautics have merited very favorable consideration by our company.

We have given your graduates priority because we have carefully checked all the men we have hired, as well as having inspected your training courses, and we are definitely of the opinion that your training meets all of our rigid requirements for highly skilled trained aircraftsmen.

We are interested in knowing when you have graduates available, since we probably will be needing men in increasing quantities from now on.

Yours very truly,
NORTH AMERICAN AVIATION, INC.
J. H. Kindelberger
President

JHK:B

# CURTISS-WRIGHT TECH

Major C. C. Moseley, President

CURTISS-WRIGHT TECHNICAL INSTITUTE P6
Grand Central Air Terminal, Glendale, Los Angeles, California
Please send information on the courses checked:
☐ Aeronautical Engineering Course ☐ Master Mechanics Course ☐ Aircraft Metal Course

NAME_____

ADDRESS_____ AGE_____

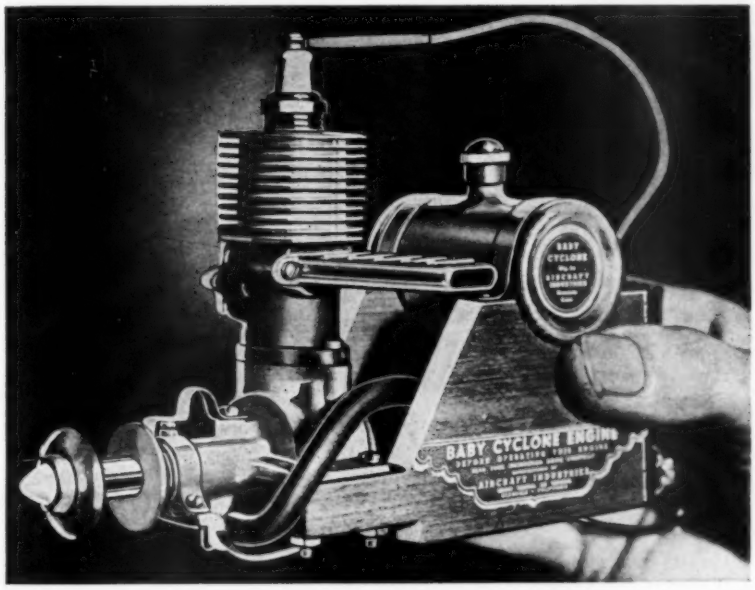
Date I plan to enroll_____ 193

America's Foremost School of Aeronautics

# ★ ★ ★ EXTRA!!

# $200.00 IN CASH FOR "BABY CYCLONE" WINNERS

## MAJ. C. C. MOSELEY OFFERS BIG PRIZES TO "BABY CYCLONE" WINNERS AT NATIONALS




## Equip Your Model Now

Win the 1936 National Championship with a "Baby Cyclone" Engine and win $100.00! There are two prizes — $100.00 cash to the winner between 16 and 21 years of age and $100.00 cash to the winner over 21 years of age.

These two cash prizes are offered to the winners in the respective age classes of the Outdoor Gasoline Powered Contest for cabin r. o. g. models provided they are powered with "Baby Cyclone" internal combustion engines. These prizes will be awarded only to the official N. A. A. winners.

Major C. C. Moseley

Major C. C. Moseley, world-war flyer, winner of the first International Pulitzer Prize Airplane Race, and President of Aircraft Industries and Curtiss-Wright Institute of Aeronautics at Glendale, California, is offering these prizes without any strings attached. The actual cash is already on deposit with the Los Angeles Chamber of Commerce and will be sent airmail to the winners the day after the meet, but the models must be powered with "Baby Cyclone" Engines.

### EVERYONE MAY ENTER

Get ready now to win $100.00 at the Nationals June 30 to July 2, 1936. All you have to do is equip your model with a "Baby Cyclone" Engine — the new sensational power plant that has been consistently winning recent meets. You have plenty of time to build your model, but start on it immediately so that you can test it and tune it up before the meet. Order your "Baby Cyclone" today either direct or from your nearest dealer. You can obtain immediate delivery. Send the coupon on the opposite page today. Do not delay.

### "BABY CYCLONES" ARE CONSISTENT WINNERS

Since their introduction only a few months ago "Baby Cyclone" Engines have already proved a sensation wherever they are flown, and have consistently won in competition.

At the recent 1936 San Diego, California, meet these economical little power plants won new fame for themselves by placing first, second and fourth against a field of 22 contestants. Flown by Mel Anderson the winning model was in the air 13 minutes 51 seconds and consumed less than one-third ounce of gasoline.

At the 1935 California State meet at Sacramento a "Baby Cyclone" model likewise won first place by flying 9 minutes 34 seconds on 6½ cubic centimeters of gasoline. This winning ship was built and flown by Bill Atwood.

These "Baby Cyclone" Engines run from 17 to 20 minutes on 1 ounce of gasoline. That is why they are consistent winners both for distant flight and in endurance meets.

### RECORD-BREAKING PERFORMANCE BUILT INTO THIS ENGINE

Engineers at Aircraft Industries spent years in developing and perfecting the "Baby Cyclone" Engine before it was offered to model builders. As a result the engine is scientifically correct, which means that it develops more power on less fuel and stands up longer.

More die-castings are purposely used in "Baby Cyclone" Engines since this is the best known precision method for manufacturing accurate small reliable parts. For strength and durability the "Baby Cyclone" has extra large oversize bearings, precision ground to .0005" clearance. The "Baby Cyclone" rotary valve is positive in action, eliminates "blow-back," and gives greater power and far more economy.

The positive "Baby Cyclone" special 2-oz. "Fire Cracker" Coil gives a red-hot spark under all conditions. This coil has over 1 mile of machine drawn copper wire wound into it. Another special feature of the "Baby Cyclone" is the gravity feed fuel system which permits installation of the tank in any advantageous location.

When you buy your engine don't be satisfied with anything less than the reliable "Baby Cyclone" at $15.75, which is backed by a large and responsible aircraft organization insuring satisfaction to you.

READ "BABY CYCLONE" AD ON OPPOSITE PAGE

XUM

**Win a FREE Trip to Europe on the new Cunard-White Star Superliner QUEEN MARY**

**IDEAL Model Ship Building CONTEST**

**Wonderful Prizes!**

**Two Free Trips to Europe**
**28 Cash Awards**
**Engraved Trophy Cups**
**"Queen Mary" Commemorative Medals**
**Hundreds of Special Prizes in Local Contests**
**Free Coupon to all Contestants for Inspection Pass to Visit the Ship**

Build a Model of the latest Greyhound of the Sea—the gigantic Cunard-White Star Superliner "QUEEN MARY", now being completed and due in New York June 1st. Enter this Big National Contest offering valuable prizes and also get into the Local Contest in your city offering hundreds of Special Prizes. Start your Model now!

**Complete Official Contest Construction Kit . $1.00**

**with "Redi-Form" Hollow Hull!**

With the cooperation of the Cunard-White Star Line, we have designed a simplified construction kit to build an accurate, scale model of the "QUEEN MARY", 18 inches long. Kit contains every item required to complete the model, including a completely shaped one-piece, hollow hull, ready for mounting decks and superstructure. Decks are outline printed on balsa sheets, easily cut to shape and mounted. Printed designs on heavy cardboard for deck enclosures, bridge and other superstructure. Ready materials for all masts, booms, funnels, ventilators, rudder, etc.
22 metal life boats with 48 davits, 2 metal anchors, rigging, and all other details to make a wonderful model reproduction of the big ship. Also cement, colored lacquer, sandpaper, etc. **Full Model Size Working Plan** with 40 "close up" diagrams of important parts and 10 large photographs showing detailed views of the finished model for you to follow. Complete step-by-step instructions for every operation—you cannot do it wrong with this kit!
Start to build your Official "QUEEN MARY" Contest Model right away and enroll in this big Model Ship Building Contest. Entry blank, contest rules, full list of prizes, judges' names and all information telling how you can enter both the National and Local Contests included in every kit.

**Ask your Dealer, or Send Coupon**

Get our Kit at your favorite Department Store, Toy Store, Craftsman or Hobby Shop. Be sure to get the IDEAL Official "QUEEN MARY" Contest Kit; look for the name on the box. If unobtainable, send the coupon below.

Pacific Coast Branch
Model Boat & Aircraft Co.
1356-5th Ave.
San Diego, Calif.

Canadian Branch
Canadian Model Aircraft
Box 23, St. Henry, Montreal

The IDEAL Company,
22-26 West 19th Street, New York, N. Y.
Please send me the IDEAL Official "QUEEN MARY" Contest Kit, for which I enclose $1.00, plus 10 cents for postage.
Please send me Special "QUEEN MARY" Contest Circular.
Name .....
Address .....
City ..... State .....


## The "Hump"

(*Continued from page* 418)

got to fly with your wings tacked to the ceiling.

If the down-draft catches you, the only remedy is to keep the course of the plane level and circle to try again for altitude. Never attempt to pull the nose of your ship up, in a down-draft. If you do, the plane will nose-over completely and park on some rock pile.

During the opening of the Dotsero Cut-off, The Denver and Rio Grande Railroad put on a big celebration. They hired me to take a news-reel photographer in my ship for aerial pictures of the canon and the celebration. The air was rough. I had a thirteen or fourteen thousand foot ceiling. I'd get the ship in position for a good picture, bank a little to give the camera man the proper angle for a good camera shot, and then I'd get a bumpy lift which would take the ship clear out of picture range.

I didn't dare settle too close into the canyon for fear one of those same rough spots would let me down a few hundred feet or so where it might be impossible to get out again.

I'd get the ship all set again for position, maneuver into the proper level and angle for a picture, and then, just as we'd get over the canyon, the reporter's camera would jam. Then we'd have it all to do over again. I banked, climbed, and pulled into position, over and over.

My passenger wanted me to get right down in the canyon and fly up and down the narrow bed of the cut. He thought the pictures would be easier to shoot. There wasn't any doubt of that! I also knew something he didn't think of! He didn't realize his camera might have to sprout wings and fly back to Denver, if we attempted such a stunt.

Down-drafts near those canyon walls would suck us right down to the canyon floor and once in the cut we'd never get out, because it was a box canyon with narrowing end walls.

I had the constant fear of running out of gas on this trip, also. There was no suitable landing place—in fact, none at all. Those hills are covered with sharp pointed pines and big rocks, and the canyon walls looked exceedingly hard and cruel at close range. I spent a lot of time and fuel circling around, to get in position.

The short hair on the back of my neck would rise in warning every time one of those bumps would put us down close to the canyon rim. Craig, Colorado,—about a hundred miles out of the way to the west—was the nearest place to refuel. The boy got his pictures, although it was like flying in a nightmare.

Down-drafts aren't the only clutching demons of the air. A storm in the mountains brings on plenty of trouble. A good deal of the rough air we have in mountain area is stirred up by distant storms. But storms themselves are a big danger in flying the "hump." They rise with great swiftness and violence, and it is frequently impossible to tell from a distance how serious a mountain thunderstorm may become.

Mountain storms always have a great deal of electrical concussion, but I have never felt there was more danger of being struck by lightning while in flight than on the ground. In flying through an electrical storm I try to keep between two storm centers and at the trailing edge of the storm, if possible.

Lightning is always worse at the front side of the storm, between these two storm centers, where one body is charged with electricity and the other is uncharged.

I have seen lightning play around the peaks, running between two high points like giant fiery ribbons, and although my plane was in the close vicinity, I am sure I was in no greater danger than in a similar storm on the ground. Naturally, if a storm shows up, it's safer to keep out of it—especially if the cloud area is black.

Local storms often do not seem bad from a distance, but prove to be much worse than they look. In such a case, the only course is to stay at the edge as much as possible and dodge the thunderbolts. Danger of being dragged into a cliff by rough air is much more likely than any trouble from lightning.

Sometimes my ship will bob like a cork on the ocean—and the plane uses as much fuel trying to stay up on the ceiling as it would take to fly the "course."

On a return trip to Denver, from Santa Fe, New Mexico, I could see just such a storm ahead. The clouds didn't look black, but the air was terribly rough. Bump! The altimeter would jump, and the ship fell a thousand feet at a time, sometimes two thousand. Then a little later I might be jogged up and gain as much as I had lost.

Often it is hard to figure out which way the storm moves. On this particular day I took off from Flagstaff, Arizona into a clear sky. After flying about a hundred miles I could see the storm loom ahead, so turned the prop for a northward course toward Gallup.

(*Continued on page* 450)


**FREE BLUEPRINTS OF THIS FLYING MODEL**

TRANSPARENT WATERPROOF

**Winnie Mae**

Get free, easy-to-follow working plans for the Winnie Mae by sending red disc from 25c tube of Du Pont Duco Cement. Quick-drying, strong, easy to use, light in weight. Makes model last more hours in the air. *Also choice of plans for Hell Diver, Akron Fighter, Laird 400.* Write Du Pont, Dept. H-1 Wilmington, Del.

DUPONT DUCO *Household* CEMENT

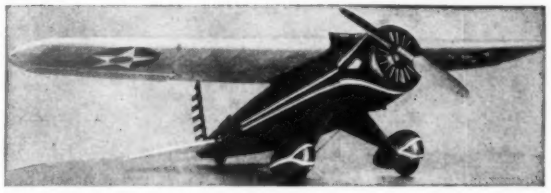
## NEW CURTISS F11C4 NAVY PURSUIT

**28" Span. Length 20½". Weight 4 oz. 1" Scale**

**THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD**

A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3¾" celluloid, 1000 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing.
**Construction Set Complete, postpaid** ..... **$4.50**

## 41" LOCKHEED ARMY SPEED VEGA



**41" Span. Length 28". Weight 8 oz. 1" Scale**

This new model, built very strong yet light in weight, is practically crashproof and will out-perform any large scale model built. Rises from ground in 10 feet and flies over 650 feet. Set contains all parts printed on balsa, ready cut pant cores, 4¼" turned motor front, 11" steel type carved paulownia wood propeller, 2½" balsa wheels, tail wheel, formed wire parts, 26" rubber, 3 oz. yellow dope, 2 oz. blue, cement ⅛ oz. black, 2 oz. glue, covering, full size scale drawing, and all parts.
**Construction Set complete, postpaid** ..... **$4.95**

## NEW BOEING P26A ARMY FIGHTER

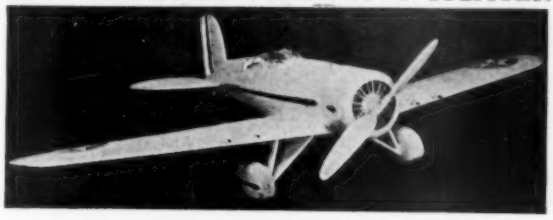
**22" Span. Length 17½". Weight 2½ oz. ¾" Scale**

Above photo shows finest equipped model of this plane on the market. Having ready made motor, cowl, prop, etc., it is very easy to build and is a beauty. Const. set contains 3" celluloid motor, 3¼" spun tapered aluminum cowl ring, 8" steel type paulownia wood prop, 1⅝" celluloid wheels, tail wheel, insignias, windshield, instrument board, 1 oz. yellow dope, 1 oz. blue, cement, glue, all parts printed on balsa, and drawing.
**Construction Set in labeled box, postpaid** ..... **$2.75**

Same set with completely finished hollow balsa fuselage, wing stubs, headrest, and rubber installed.
**Set, postpaid** ..... **$4.50**

Note: In issuing money orders, use St. George, N. Y., postoffice

## NEW LOCKHEED P23A NAVY FIGHTER

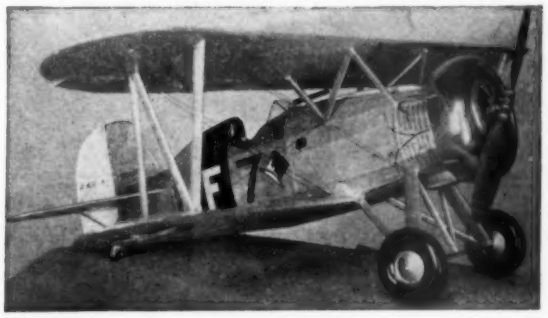


**COMBINATION LAND AND SEA PLANE SET**

**32" Span. Length 22½". Weight 3½ oz. ¾" Scale**

New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc., printed on balsa, a 3⅜" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ⅛ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 feet of rubber, and large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world.
**Construction Set in labeled gift box, postpaid** ..... **$2.95**

## NEW BOEING F4B4 NAVY FIGHTER



**22½" Span. Length 14½". Weight 2¼ oz. Color, Silver and Yellow**

This is the finest equipped Boeing, F4B4 model in the world. New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished propeller, printed out balsa wood parts, silver dope, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing. **Construction Set complete, postpaid** ..... **$2.95**

## NEW NORTHROP FT1 NAVY FIGHTER

**22" Span. Length 15". Weight 2½ oz. ¾" Scale**

A beautiful flying model of the latest Northrop 280 m.p.h. fighter. Set contains 3" turned motor front, 8" carved propeller, insignia, silver, black and clear dope, glue, all parts printed on balsa, full scale drawing, and all parts to build as shown.
**Construction Set complete, postpaid** ..... **$2.00**

**Photo of new type hollow balsa fuselage furnished in set as shown with built-in headrest, wing stubs and rubber motor. This fuselage is part of the $4.50 Boeing P26A Set.**

**CURTISS HAWK P6E**

Const. set contains all parts printed on balsa, blue and yellow dope, glue, drawing, and all parts.
**Set, postpaid** ..... **$2.50**

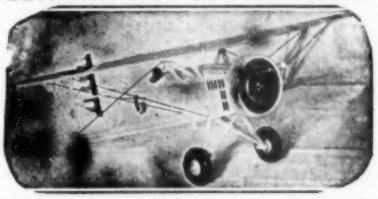
**24" Span. Flies 500 Feet.**

## NEW NORTHROP D2 ARMY PURSUIT

**36" Span. Weight 4 oz. ¾" Scale**

A de luxe set including 3" 9-cylinder celluloid motor, special 3¼" streamline tapered aluminum cowl, 9" steel type carved prop, all parts printed on balsa, silver paint, glue, tissue, aluminum, motor front, wheels, insignia, wire parts, tissue, and scale drawing.
**Const. Set complete, postpaid** ..... **$3.75**

## CURTISS NAVY SEA HAWK P3A



**15" Span. Length 10½". Wt. 1¼ oz. Scale ½".**

Set contains 2" celluloid motor, aluminum cowl ring, carved prop, 1½" celluloid wheels, all parts printed on balsa, insignia, drawing, etc. This is a dry set, without liquids.
**Construction Set, postpaid** ..... **75c**

**CATALOGUE.** **Send 3c stamp for 8"x10" Illustrated Catalog, showing large pictures of all models, gas motor driven models, motors, supplies, etc.**

***Note: Our models are the easiest to build and finest equipped in the world. All models are equipped with special "Brown" rubber which gives 20% longer flights.***

California Dealer: JAYS MODEL AIRCRAFT, 7763 Melrose Ave., Hollywood, California

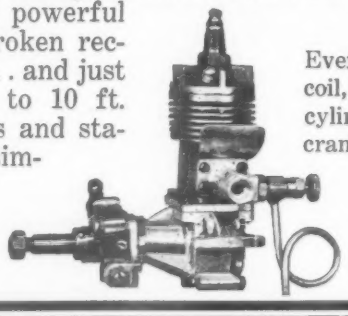
**MINIATURE AIRCRAFT CORP., 83 Low Terrace, New Brighton, New York**

XUM

# G. H. Q. again in Model

## INTRODUCING SPECTACULAR GASOLINE MOTORS at the lowest

Never before were more stirring words indelibly written in the skies! Only once in a century is an announcement of such great importance made that it destines to revolutionize the model airplane field. And there's an excellent reason .... for the most hair-raising thrill you've ever experienced will be yours with the G.H.Q. "Loutrel" motor—an outstanding scientific achievement—actually one of the most powerful motors ever constructed. Has broken records for amazing performance .... and just imagine—flies model planes up to 10 ft. wingspread. Also used for boats and stationary use. Easy to start—and simple as ABC to assemble—average assembly time is only 45 minutes. So easy only a screwdriver is needed.



Everything is in the kit including plug, coil, condenser, tank, ignition wire, cylinder, piston, connecting rod, timer, crankshaft, all screws, nuts, bolts, etc. Every part is fully machined and finished. No oil, gas, batteries or propeller included. Postpaid for only $8.50.

## AND DON'T FORGET THESE MARVELOUS G. H. Q. VALUES

## 5 ft. Flying Scale Models ⅓ size of real planes!

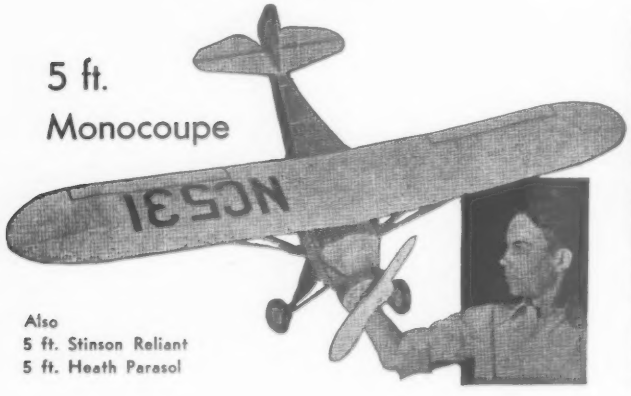
These are the giant models that have amazed the model builders of America.

**$1 EACH** PLUS 35c for PACKING, POSTAGE & INSURANCE

IF EXPRESS COLLECT SEND ONLY $1.00

**CONTENTS:** Each of these new G.H.Q. Giant 5 ft. Model Planes contains full-size Plans, all ribs, formers and curved parts clearly printed on best grade Balsa. Large bottles Cement and Dope, different colors Japanese Tissue, Special Endurance Rubber, finished Ready-Cut 3" Wheels. Wire, Balsa strips cut to size, Washers, and . . . Movable Controls, shock-proof Landing Gear, Scale Details, Lettering, Numbering and Insignias, Flight Log, etc.

5 ft. Monocoupe




Also
5 ft. Stinson Reliant
5 ft. Heath Parasol

## 24" FLYING SCALE MODELS 25c

plus 10c packing, postage, insurance

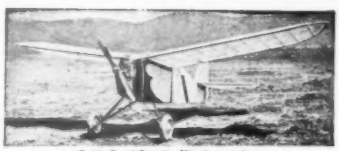
24" STINSON "R." 25c

Each 24" G. H. Q. Kit is complete in every detail. A liberal quantity of everything. 21 models to select from at 25c each.

24" CURTISS ROBIN. 25c

| | | |
|---|---|---|
| Puss Moth | Army Hawk | Stinson "R" |
| Polish Fighter | Monocoupe | Curtiss JN4 |
| Army Falcon | Fairchild "22" | Bellanca |
| Sopwith Camel | Aeronca | Spad |
| Fokker D-7 | Fokker D-8 | Jap Kawasaki |
| SE5 | Nieuport | Russian Fighter |
| Aeromarine | Douglas Mailplane | |

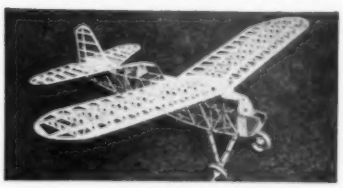
# HERE IS THE NEWEST G. H. Q. SENSATION!


G.H.Q. "Loutrel" Sportster

G.H.Q. "Loutrel" Sportster kit specially designed for G.H.Q. "Loutrel" Gasoline motor but may be used for any other motor of like weight and power. Built according to scientific aerodynamic principles—Has made hundreds of successful flights without crackup—Marvelous glider . . . . And what a climber! 4-hour flights are common! A complete kit of all parts including plan, all wood, wire wheels, metal and all other parts. Postpaid for only $5.00.

## READY-TO-RUN G. H. Q. "LOUTREL" MOTOR

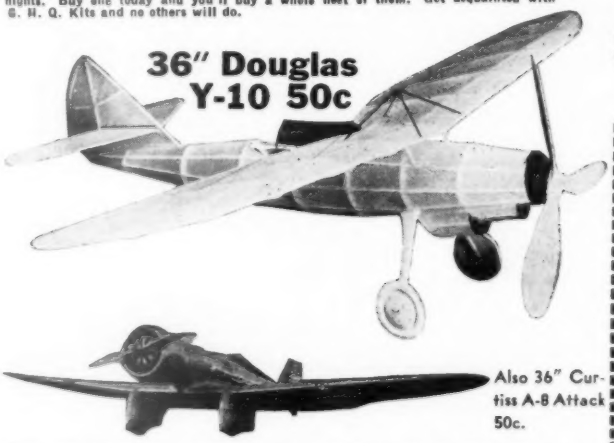
The famous "Loutrel" motor complete with propeller block included; entirely assembled on stand. Tested and run before shipment—Performance guaranteed—1/5 horsepower at 3000 to 7000 R.P.M.—No oil, gas or batteries included. Postpaid for only $12.50.


G.H.Q. "Loutrel" Sportster not covered to show structural details.

**36" Flying Scale Models 50c** Plus 20c Package, Postage, Insurance

**DEALERS WRITE!**

G. H. Q. Scale Models are the best Kits your money can buy for appearance and flights. Buy one today and you'll buy a whole fleet of them. Get acquainted with G. H. Q. Kits and no others will do.





Also 36" Curtiss A-8 Attack 50c.

36" Northrop Gamma "Sky Chief" 50c

## ORDER TO-DAY
## 24 HOUR DELIVERY

Gasoline Motors, Gasoline Planes, Gasoline Accessories and Parts as well as all other G.H.Q. Kits or send 3c Stamp for Catalog.

Order by Coupon or Letter

G.H.Q. MODEL AIRPLANE CO., 364 P. SOUTHERN BLVD., NEW YORK, N. Y.

Enclosed find $..... Please send the following kits as checked.

G.H.Q. "Loutrel" Motor Kit, postpaid.....$8.50 ☐
G.H.Q. "Loutrel" Sportster Kit, postpaid..... 5.00 ☐
Ready to Run G.H.Q. "Loutrel" Motor, postpaid...12.50 ☐

12" SOLID KITS — 12" Kits 15c each postpaid.
- ☐ Boeing 247D
- ☐ Ryan Racer
- ☐ G.A. Coast Guard Amphibian
- ☐ D.H. Comet
- ☐ Lockheed Orion
- ☐ Sikorsky S-41
- ☐ Douglas Airliner
- ☐ Dewoitine D-33
- ☐ U.S. Army Martin Bomber
- ☐ Monocoupe 145D

24" FLYING KITS — 24" Kits 25c each postpaid.
- ☐ Curtiss JN4
- ☐ Bellanca
- ☐ Nieuport
- ☐ Douglas Mailplane
- ☐ Stinson SR1
- ☐ Mass Midget
- ☐ Pokker D-7
- ☐ Fokker D-8
- ☐ Polish Fighter
- ☐ Monocoupe
- ☐ Falcon Jan Kraissaki
- ☐ Aeromarine Russian
- ☐ S. E. 5 Fighter
- ☐ Sopwith Camel Spad
- ☐ Aeronca
- ☐ Fairchild
- ☐ Army Hawk
- ☐ Curtiss Robin

36" FLYING KITS
- ☐ Douglas Y-10
- ☐ Curtiss A8 Attack
- ☐ Northrop Gamma "Skychief"

48" FLYING KITS
- ☐ Monocoupe
- ☐ Stinson Reliant
- ☐ Heath Parasol

NAME .....
STREET .....
CITY .....STATE.....

PATENT DEPARTMENT
PHOTOSTAT COPY
FOR REFERENCE ONLY

# Build your next Model 100% True Scale

Build one of these beautiful IDEAL "Super Detail" Flying Models; each one accurately designed by flying men, with cockpit operated controls and other exclusive features. Pick from the list below. Ask your dealer or send the coupon . . .

## SuperDetail Flying Models

**BOEING P-26-A** Wingspan 21¼ in., Length 18 in., Weight 2½ oz., Scale ¾ in.; beautifully colored olive drab and yellow. Complete Kit.....$1.75

## CURTISS GOSHAWK

**Wingspan 23⅜ in., length 16¾ in., weight 3⅜ oz., exact ¾ in. scale.** Coated with new IDEAL high lustre finish, with silver, yellow, red and black coloring. Kit complete, postpaid .....$2.00

**RYAN ST**—Wingspan 22½ in., Length 16½ in., Weight 2½ oz., Scale ¾ in.; with dual control system operated in either cockpit; adjustable wing flaps; and plans for making an engine with 4 cylinders, carburetor, spark plugs, etc. Complete Kit .....$1.50

**STINSON RELIANT**—Wingspan 32⅝ in., Length 21¼ in., Weight 3½ oz., Scale ¾ in. Complete Kit.....$2.50

**MARTIN BOMBER**—Wingspan 35 in., Length 22½ in., Weight 4¾ oz., Scale exact. Complete Kit.....$3.50

## Try this New IDEAL Tru-Cut Nife

Razor-edge blade securely fastened in a long, easy-grip handle. Cuts balsa like butter; follows intricate curves easily. Fine for any cutting purpose. Get one! Postpaid for 15c each; extra blades, 3 for 10c.

## Build a Model of the S. S. NORMANDIE

An accurate, realistic reproduction of the Trans-Atlantic Record Holder. 32½ in. long. Shaped hull—over 100 metal fittings—1000 portholes—60 metal davits—30 life boats—16 winches—24 cast metal stairways—complete with all wood and fibre parts—high lustre colors—full size Plans and Instructions. Postpaid for $7.00.

## Illustrated Catalog—Bulletins

Beautifully illustrated Bulletins of Model Ships and Airplanes, with Lists of Boat and Airplane Parts, Supplies and Materials—all for only 5c.

Pacific Coast Branch:
Model Boat & Aircraft Co.,
1356-5th Ave., San Diego, Calif.

## IDEAL AEROPLANE & SUPPLY CO., INC.

22-26 W. 19th St., New York City.

Please send the items I have checked. I am enclosing $..... (West of Denver 25c extra. All plans postpaid. Canadian Prices 40% higher to cover duty.

Boeing P-26A ☐$1.75 Stinson Reliant Airliner ☐$2.50
Martin Bomber ☐3.50 Curtiss Goshawk ☐$2.00
Ryan S T ☐$1.50 S. S. Normandie ☐$7.00
Tru-Cut Nife ☐15c Catalogue Bulletin ☐5c

Please print name.....

Address .....

City..... State.....

BUFFALO PUBLIC LIBRARY
DEPARTMENT OF TECHNOLOGY


## The "Hump"

(*Continued from page 446*)

The storm moved so fast I couldn't catch it—although I tailed along for two hours at top speed. We zoomed into Albuquerque just ahead of the rain and when I gave the ship the gun on taking off again a little later, I banked into a circle fifty miles south—to get out of the storm area. I found later we had detoured the edge of the storm, only to crack into it again on the other side.

Many flyers who come to Denver on their way across the range fail to take advice from local talent. It would save them time, fuel and money, as well as occasional more serious consequences.

Not so long ago, a doctor came into this country. He had a splendid ship and was he proud of it? He boasted about how much fuel his gas tanks would hold. He planned to fly the "hump" and he filled both tanks to capacity in spite of contrary advice.

Nobody could convince him that his ship couldn't lift the fuel supply. He wasn't going to run out of gas half-way! He'd never heard of the old witch of the mountains—the down-draft which might catch him. He wouldn't listen to the boys—he thought it was a fairy tale.

The example is doubly tragic because it was so unnecessary. His ship was pulled down by the fuel weight. It caught in a down-draft, crashed on a mountain side and he was killed.

During an aerial map survey taken at twenty thousand feet above some of these hills, one of the flyers, G. Watson (Slim) Babbitt, tells an amusing story of engine failure. It wasn't so amusing at the time.

Something went wrong and Slim knew he'd have to hunt a parking lot right away. At twenty thousand feet you can't see the ground well enough to be sure of landing in any one spot—certainly not on a smooth field. Almost any stumpy clearing looks smooth at that distance. Moreover in getting into position to fly the strip, the ship was about twenty miles away from the base field, as well as twenty thousand feet up in the air. Slim knew he had no chance of getting back to the field with his engine failing him.

Slim spun down fast in a circle, until close enough to level out and make some sort of a choice—if there was one—of a landing field. He dropped eight hundred to a thousand feet a minute, with the photographer in the back of the ship holding his ears, and yelling bloody murder, all the way down.

Slim's ears popped like a Fourth of July celebration, and hurt like the dickens. He knew why his partner yelled. Neither of them could hear a word for some time after they landed. Slim laid the ship down in a corn field—one of those small mountain farms—with no serious breakage except a cracked landing gear.

In spite of their popping ears, neither man was injured, although they pancaked in pretty hard. It was just another lucky break, however, coupled with good flying, for that forty acre field was the only one for miles around. A man could have a case of the "bends" after a fast fall from great altitude—such as deep-sea divers have when the air in their diving suits is too thin and they come into pressure of ordinary atmosphere too quickly.

In a heated cabin plane, the intense cold of high altitude and mountain flying is not noticeable. In an open cockpit ship in the winter, we wear fur-lined flying suits. Cold causes a slow-up of a pilot's mental and mechanical reactions which can be quite dangerous, even when protected by heavy clothing. I find, too—particularly in winter—that after coming in from a trip over the "hump" I feel a peculiar sleepy exhaustion, due to the "thin air" of the altitude thru which the ship traveled. This has nothing to do with the heart, but is caused by insufficient oxygen found above ten or twelve thousand feet. A short time after landing I feel all right.

END.


# FREE! 1 DOZ. SHEETS JAP TISSUE or MODEL BUILDER'S KNIFE

WITH ORDERS OF $1 OR MORE

Take advantage of this special FREE offer now! Experience what a real pleasure it is to do business with a model airplane supply house that keeps promises! Every order is shipped same day received! All materials are of highest quality! Prove this to yourself! Learn why so many builders, dealers and clubs deal with SKYWAY! Dealers! Send for prices on Balsa wheels with Brass Bearings

**18" BALSA SHEETS**
1/32x2, 5 for 6c..10 for 10c
1/16x2, 5 for 6c..10 for 12c
3/32x2, 3 for 5c.. 7 for 10c
⅛x2, 1 for 2c.... 6 for 8c
3/16x2, 1 for 3c..3 for 7c
¼x2, 1 for 4c....3 for 9c
½x2, 1 for 5c....3 for 14c

**BALSA PROP BLOCKS**
¼x¾x6, 1 for 1c..6 for 5c
½x¾x5, 1 for 1c..5 for 5c
⅝x1x8, 1 for 2c....3 for 5c
¾x1x8 .....2 for 5c
¾x1¼x12, 1 for 3c 2 for 6c
1x1½x12 .....2 for 11c
1x1½x15 .....1 for 7c

**18" BALSA LENGTHS**
1/16x1/16 .....50 for 5c
1/16x⅛ .....40 for 5c
1/16x3/16 .....20 for 5c
1/16x¼ .....18 for 5c
3/32x3/32 .....35 for 5c
⅛x⅛ .....30 for 5c
¼x¼ ..... 6 for 5c
¼x½ ..... 4 for 5c
½x½ ..... 2 for 5c

**18" BALSA PLANKS**
1x1, 2 for..... 9c
1x2, 1 for..... 9c
2x2, 1 for.....16c
2x3, 1 for.....20c
2x6, 1 for.....35c

For 36" lengths double above prices and add 10c postage

**Bamboo**
1/16x12, 40 for 5c
1/16x¼x15 .....6 for 5c
Shredded..40, 5c

**Thinner Best Sheet Celluloid**
1 oz. .....5c
2x6 ..... 2c
6x8 ..... 4c
12x16 ..... 15c

**Clear Dope**
1 oz. ..... 5c
½ pt. .....25c

**Colored Dope**
1 oz. ..... 5c
½ pt. .....30c

**Clear Cement**
1 oz. ..... 5c
½ pt. .....30c

**Wood Veneer**
20x30", 1 for 9c
2 for .....17c

**Japanese Tissue**
All colors, Doz. 16c

**Balsa Balloon Wheels**
½" .....pr. 2c
¾" .....pr. 3c
1" .....pr. 4c
1½" .....pr. 6c
2" .....pr. 8c
3" .....pr. 15c

**THRUST BEARINGS** .....1c
**BRUSHES, No. 8** .....5c

**Reed**
1/32, 1/16, ⅛ .....3 ft. 1c

**Wooden Wheels**
½", pair ....2c
¾", pair ....3c
1", pair ....4c
1½", pair ....5c
1¾", pair ....8c

**Celluloid Wheels**
¾", pair .... 5c
1", pair .... 7c
1½", pair .... 9c
1⅞", pair ...15c

**Rubber Motors**
1/16 sq..20 ft. 5c
⅛ flat...20 ft. 5c

**INSIGNIAS—**
French, American, English, German
1¼" ....4 for 3c
2" ..... 1c
1 sheet of 24, 5c

**MODEL PINS,** Lge. & Sml. .5c pkg.
**BUSHINGS,** doz. 3c
**PROP. SHAFTS,**
2 for ..... 1c

**PAUL-O-WINA JAP PROPS**
5" ..... 10c
(Add 5c per inch for props up to 10".)

**Machine Props**
5" .....4c
(Add 1c per in. for props up to 16".)

**MODEL BUILDER'S KNIFE** 12, 10c per doz.
**SPOT WELDED HOLLOW ALUMINUM WHEELS**
1" .....pr. 6c
1½" .....pr. 11c
1⅞" .....pr. 14c
**WASHERS,** ½ and ⅛ .....doz. 1c
**SANDPAPER,** package ....5c
**WIRE,** 6 ft...3c
36" lengths.
**ALUM. LEAF,** 2 sheets for 1c
**NOSE PLUGS,** large..10c doz. small...5c doz.

**Dummy Radial Engines**
1½" Diam...15c
2" Diam.....20c
3" Diam.....25c
**DOWELS,** ⅛x12, 10c per doz.

Send 3c stamp for "Helpful Hints for Model Builders" and catalog for other bargains. FREE with all orders. ORDERS 75c or under 15c postage. Postage prepaid on orders over 75c. West of Mississippi add 10c extra. Canada add 15% extra. CASH OR MONEY ORDER—NO STAMPS. NO C. O. D.'s.

**SKYWAY MODEL AIRCRAFT SUPPLY CO.** 383 Seventh Ave., Dept. P Brooklyn, N. Y.

# WE WON'T BE UNDERSOLD!

ALL MERCHANDISE SOLD ON A MONEY-BACK GUARANTEE BASIS!

DEALERS! MODEL BUILDERS! SAVE TIME AND MONEY! ORDER DIRECT FROM THIS AD!

**Money talks! So do Universal low prices. Here's your great opportunity model builders and dealers! Look over this advertisement TODAY. All supply prices slashed to rock bottom. ORDER NOW BEFORE THIS OFFER IS WITHDRAWN. You must be 100% satisfied or money back. GET IN ON OUR BIG FREE OFFER—See details Below!**

**Balsa Strips**

| 18" lengths | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/32x1/8 | 100 for 5c | 200 for 10c |
| 1/16 sq | 100 for 5c | 200 for 10c |
| 1/32x3/16 | 40 for 5c | 100 for 9c |
| 1/32x1/4 | 40 for 5c | 100 for 9c |
| 1/32x3/8 | 20 for 5c | 100 for 12c |
| 1/32x1/2 | 18 for 5c | 100 for 13c |
| 1/16x1/2 | 7 for 5c | 50 for 15c |
| 1/8 sq | 35 for 5c | 100 for 12c |
| 3/16 sq | 100 for 5c | 100 for 14c |
| 1/8x1/4 | 14 for 5c | 50 for 12c |
| 1/8x1/2 | 10 for 5c | 50 for 13c |
| 1/16x3/8 | 6 for 5c | 25 for 10c |
| 1/16x1/2 | 4 for 5c | 25 for 13c |
| 1/4 sq | 10 for 5c | 50 for 16c |
| 1/32x3/8 | 5 for 5c | 25 for 10c |
| 1/8 sq | 8 for 5c | 50 for 20c |
| 1/4 sq | 4 for 5c | 25 for 19c |
| 3/8 sq | 3 for 5c | 25 for 27c |
| 1/2 sq | 3 for 5c | 25 for 27c |

See ordering instructions for 36" length prices.

**Balsa Prop Blocks**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/2x3/4x5 | 7 for 5c | 12 for 9c |
| 1/2x3/4x6 | 7 for 5c | 12 for 9c |
| 5/8x1x7 | 3 for 5c | 12 for 14c |
| 3/4x1x8 | 3 for 5c | 12 for 17c |
| 3/4x1 1/4x10 | 2 for 5c | 6 for 15c |
| 3/4x1 1/4x12 | 2 for 6c | 6 for 17c |
| 1x1 1/2x12 | 1 for 6c | 6 for 19c |
| 1x1 1/2x15 | 1 for 7c | 6 for 26c |

**Carved Balsa Props**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 5" | 1 for 4c | 12 for 22c |
| 6" | 1 for 5c | 12 for 25c |
| 7" | 1 for 6c | 12 for 33c |
| 8" | 1 for 7c | 12 for 38c |
| 9" & 10" | 1 for 10c | 12 for 48c |
| 12" | 1 for 12c | 12 for 58c |

**Colorless Cement**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1 oz. bots. | 1 for 5c | 6 for 22c |
| 2 oz. bots. | 1 for 8c | 6 for 40c |
| 4 oz. bots. | 1 for 15c | 3 for 35c |
| 1 pt. | 1 for 50c | 1 for 35c |
| 1 qt. | | 1 for 65c |
| 1 gal. | | 1 for 1.60 |

**Birch Wheels—Light, strong**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/2" | pr. for 2c | 12 for 5c |
| 3/4" | pr. for 3c | 12 for 6c |
| 1" | pr. for 4c | 12 for 8c |
| 1 3/8" | pr. for 5c | 12 for 10c |
| 1 7/8" | pr. for 8c | 12 for 15c |

**Balsa Balloon Wheels**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/2" | pr. for 2c | 12 for 9c |
| 3/4" | pr. for 3c | 12 for 11c |
| 1" | pr. for 4c | 12 for 14c |
| 1 3/8" | pr. for 6c | 12 for 19c |
| 1 7/8" | pr. for 8c | 12 for 35c |
| 3" | pr. for 15c | 6 for 37c |

**Celluloid Wheels**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 3/4" | pr. for 5c | 12 for 24c |
| 1" | pr. for 7c | 12 for 25c |
| 1 3/8" | pr. for 9c | 12 for 35c |
| 1 7/8" | pr. for 15c | 12 for 60c |
| 3" | pr. for 30c | 6 for 75c |

**Aluminum Cowlings**

Closed, open, or drag ring

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1 1/2" | 1 for 15c | 3 for 25c |
| 2" | 1 for 18c | 3 for 35c |
| 2 1/2" | 1 for 20c | 3 for 43c |
| 3" | 1 for 25c | 3 for 55c |
| 4" | 1 for 35c | 2 for 52c |

**Sheet Aluminum**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| .0063x3 1/2" | 2 ft. for 1c | 25 ft. for 10c |
| .002 thick, | sq. ft. for 8c | 5 ft. for 35c |
| .005 thick, | sq. ft. for 10c | 5 ft. for 50c |
| .010 thick, | sq. ft. for 17c | 5 ft. for 75c |

**Aluminum Tubing**
(Special 1/100" wall)

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/8 O.D. | 1 ft. for 9c | 5 ft. for 30c |
| 3/16 O.D. | 1 ft. for 7c | 5 ft. for 32c |
| 1/4 O.D. | 1 ft. for 7c | 5 ft. for 32c |
| 5/16 O.D. | 1 ft. for 9c | 5 ft. for 40c |
| 3/8 O.D. | 1 ft. for 10c | 5 ft. for 40c |

# FREE!

**With orders of 50c or more 2 Sheets Jap Tissue (any color) and your choice of any 3 Plans (See listing *) Value 30c.**

Free with $2.50 order and over—12 plans and 12 sheets of tissue, value 75c.

Free with $5.00 order and over—1 gallon of colorless cement (add 75c for can and packing). 1 gallon equals 128 ounces which retails at 5c each.

**Balsa Sheets**

| 18" lengths | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/32x2 | 3 for 5c | 20 for 16c |
| 1/16x2 | 4 for 5c | 20 for 14c |
| 1/32x2 | 4 for 5c | 20 for 17c |
| 3/64x2 | 3 for 5c | 15 for 15c |
| 1/32x2 | 3 for 5c | 13 for 16c |
| 1/8x2 | 2 for 5c | 10 for 15c |
| 1/4x2 | 2 for 5c | 8 for 16c |
| 1/32x2 | 1 for 5c | 5 for 20c |

For sheets 3" wide, double the 2" price. See ordering instructions for 36" length prices.

**Balsa Planks**

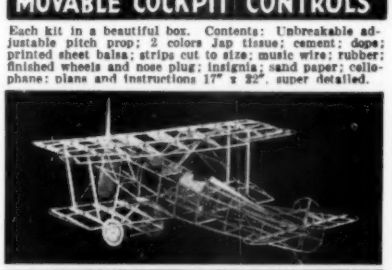
| 18" lengths | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1"x1" | 1 for 4c | 2 for 6c |
| 1"x1 1/2" | 1 for 8c | 2 for 8c |
| 1"x2" | 1 for 9c | 2 for 13c |
| 1"x3" | 1 for 14c | 2 for 20c |
| 1 1/2"x1 1/2" | 1 for 12c | 2 for 20c |
| 2"x2" | 1 for 16c | 2 for 23c |
| 2"x3" | 1 for 20c | 2 for 32c |
| 2"x6" | 1 for 35c | 1 for 30c |

See ordering instructions for 36" length prices.

## S-E-N-S-A-T-I-O-N-A-L
## 15" FLYING SCALE MODEL

**MOVABLE COCKPIT CONTROLS**

Each kit in a beautiful box. Contents: Unbreakable adjustable pitch prop; 2 colors Jap tissue; cement; dope; printed sheet balsa; strips cut to size; music wire; rubber; finished wheels and nose plug; insignia; sand paper; cellophane; plans and instructions 17" x 22", super detailed.



**4 for $1.00 Postpaid**

Post & Roger's Plane, Great Lakes Trainer, Northrop Fighter, New Monocoupe, Douglas Gull Wing, Fokker D VII, Ben Howard's Ike, Waco Taperwing. All 15" wingspreads.

## 3 for 25c, postage FREE

Here's a new fleet ready to take off . . . they're solid replicas with all complete supplies and accessories and short cut plans. Your choice of: Northrop Fighter, Curtiss Attack, Seversky Racer, Brown Racer, Mr. Mulligan Racer, Wedell Williams Racer, Mystery Ship, Boeing Fighter—3 for 25c. Postage FREE.

## HOW TO ORDER SUPPLIES

**Free postage on all orders from 75c to $2.50. Orders under 75c add 15c postage. West of Miss. add 10c extra. Canada add 15% extra. Orders over $2.50 (Because of large discounts) sent Railway Express collect. NO COD'S! When ordering 36" lengths, add 10c extra for packing and double 18" prices.**

**Clear Dope or Banana Oil**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1 oz. bots. | 1 for 5c | 6 for 22c |
| 2 oz. bots. | 1 for 7c | 6 for 40c |
| 4 oz. bots. | 1 for 13c | 3 for 35c |
| 1 pt. | 1 for 45c | 1 for 35c |
| 1 qt. | | 1 for 65c |
| 1 gal. | | 1 for 1.45 |

Thinner same price as clear dope.

**Colored Dope**

White, Yellow, Orange, Red, Green, Olive Drab, Blue, Black, Silver, Gold or Gray.

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1 oz. bots. | 1 for 5c | 6 for 25c |
| 2 oz. bots. | 1 for 10c | 6 for 45c |
| 4 oz. bots. | 1 for 19c | 3 for 50c |
| 1 pt. | 1 for 65c | 1 for 40c |
| 1 qt. | | 1 for 75c |
| 1 gal. | | 1 for 1.90 |

***Plans:**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| Full size, 17" x22", detailed with movable cockpit controls. | 1 for 10c | 8 for 40c<br>3 for 25c<br>6 for 50c |
| | 3 for 25c | 24 for 1.00<br>64 for 2.50 |

Post & Roger's Plane, Great Lakes Trainer, Northrop Fighter, New Monocoupe, Douglas Gull Wing, Fokker D VII, Ben Howard's Ike, Waco Taperwing. All 15" wingspreads. **Plans may be ordered separately at prices listed . . . postage FREE.**

**Jap Tissue**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 20x24 White | 2 for 5c | 12 for 11c |
| | 6 for 8c | 25 for 22c |
| Colored asst. | 2 for 5c | 12 for 14c |
| | 6 for 8c | 25 for 29c |
| Silver | 1 for 5c | 12 for 21c |
| Super Fine | 1 for 5c | 12 for 40c |

**Rubber**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| skein=225 ft. | | skein .35 |
| .045 sq. flat | 20 ft. for 5c | skein .40 |
| 1/8 flat | 20 ft. for 5c | skein .70 |
| 3/16 flat | 12 ft. for 5c | skein .1.00 |
| Any size | | lb. |

**Dummy Radial Engines-cell.**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1 1/2" | 1 for 15c | 3 for 40c |
| 2" | 1 for 20c | 3 for 55c |
| 3" | 1 for 25c | 3 for 70c |

**Brass Bushings or Eyelets**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 1/16 | dz. for 3c | 100 for 12c |
| 3/32 | dz. for 4c | 100 for 15c |
| 1/8 | dz. for 5c | 100 for 18c |

**Thrust Bearings (Hard Steel)**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| Small | 5 for 5c | dz. for 6c |
| Small | | gr. for 55c |
| Large | 6 for 8c | dz. for 7c |
| Large | | gr. for 70c |

**Wire (Straight Lengths)**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| No. 6 | 10 ft. for 5c | 100 ft.—15c |
| No. 8 | 10 ft. for 5c | 100 ft.—18c |
| No. 10 | 10 ft. for 5c | 100 ft.—20c |
| No. 12 | 10 ft. for 5c | 100 ft.—23c |
| No. 14 | 10 ft. for 5c | 100 ft.—26c |

**Insignia Sheet**

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| 24 & markings for tail and rudder. Gummed. | 1 for 5c<br>6 for 25c | dz. for 36c<br>100—1.75 |

| | For Orders Under $2.50 | For Orders Over $2.50 |
|---|---|---|
| Washers | | |
| 1/4 or 1/40 O.D. | 12 for 1c | 100 for 5c |
| | 144 for 10c | 200 for 9c |
| Sandpaper | 1 pkg. 5c | 12 pkgs. 25c |
| Noseplugs | 12 for 5c | 100 for 40c |
| Reed | 1/8 or 1/4 6 ft. | 2c 50 ft. 18c |
| Reed | 1/8 or 1/4 5 ft. | 2c 50 ft. 20c |
| Bamboo | 1/8 sq. x 12 | 40 for 5c; 144 for 15c |
| | 1/8x1/4x15 | 1 for 1c; 12 for 6c |
| Model Pins | 1 pkg. 5c | 12 pkgs. 35c |

**Sheet Celluloid**

(6"x8") .....1 for 5c 13 for 45c

**Wood Veneer**

Paper 20x30 .....1 for 9c 1 for 7c

Paul-O-Wins 5" .....10c

Jap Props (hand carved, very light). (add 5c per inch up to 10 inches.)

**UNIVERSAL MODEL AIRPLANES, Inc., 139P Emerson Pl., Brooklyn, N. Y.**

## Gates Circus

(*Continued from page 428*)

turn about and, after keeping the nose glued on the old Hudson for some twenty minutes, come into Poughkeepsie from the north instead of the southwest? Pang, watching us taxi up, stood in the center of the airport with his arms on his hips, and asked cheerfully, "Well, how *is* the country? Been sightseeing, eh?"

The airport at Poughkeepsie consisted, mainly, of a small clearing with a stone fence running through the middle of it, surrounded with wooded rolling hills on three sides.

This Saturday was a particularly windy and bumpy day and until noon it was impossible to fly our cumbersome crates. Long after the rest of the outfit had gone to the field, Lee Mason and I were sitting in the lobby puffing on our cigars. We firmly believed that, on a day like this, anything could and might happen, so why do it? Besides, we had been knocking off more than eight hundred dollars a month and decided it was about time that we took a brief holiday.

Our peaceful mood was interrupted by a familiar sound and we spotted Roy's crate flying over the town. Grinning widely, we decided that if Roy could fly in that air, we certainly could stand on the field and let him entertain us.

But when we reached the airport we found another surprise awaiting us. Rushing towards a spot among the trees just north of the field, was a streaming excited crowd. "Diavolo" Krantz came up then and greeted us derisively.

"You're a fine couple of bozos. We've had a crowd here since ten o'clock this morning and nobody here to fly them. Roy was trying to haul four out of this cow pasture against orders, when a downdraft hit him just as he got off and he sat down in the trees, right ahead of him, and with the motor going wide open!"

So that was it! Although Roy cracked both his lower wings, landing-gear and propeller, no one was injured except Roy himself who got a bloody nose and a beautiful black eye. With one ship washed out and Pang and McKinney unable to take up all comers, Lee and I decided to go to work.

Towards the latter part of the afternoon, as the sun circled towards the west, flying into it against the strong gusty winds was no picnic. Actually, it was one of the hardest days of my flying with the outfit. But, outside of Roy's crack-up, that Saturday was a complete success. We closed the exhibition with the usual evening's "bally", which meant fifteen minutes of formation flying, individual aerobatics, rope ladder stunts by "Diavolo" Krantz and a parachute jump.

Then our barker, in his best hog-calling voice, informed the populace that the activities for the day were over, but to be sure to return early the next morning. When the crowd began to disperse, we kept busy by driving tie-down stakes into the ground and fastening our birds to them with stout ropes. A tarpaulin over the cockpits and we were ready to pile into our truck and return to the hotel for some amusement and the welcome shut-eye.

It is strange how tired one can become after several hours of this type of flying.

Taking off with capacity loads out of "postage stamp" fields and landing within a few seconds, off again, a quick circle and another landing, over and over again until one's eyes become bleary and sightless, one's back is aching to the breaking point and the nerves are tied and tense in all sorts of fancy knots due to the constant strain.

The mechanics and "grease balls" were worked as badly and it was amazing that after such a day's labor there was any energy and enthusiasm left in us. But invariably, as the big red cov-

(*Concluded on page 466*)

**HERE'S YOUR MOTOR!**

Light weight . . low cost. The Hallman Model B50 develops 50 H.P. at 2000 RPM. Bore 4". Stroke 4¼. Compression ratio 4.8 to 1. Displacement 214 cubic inches. Dry 187 lbs. Complete set of unmachined castings including blue prints can be purchased in three groups at $20 a group.

Write for additional information

HALLMAN AIRCRAFT CO.
694 East 7th St. St. Paul, Minn.

**GAS MOTOR DRIVEN SCALE MODELS**

82" NEW LOCKHEED ARMY SPEED VEGA, 1/5 H.P.

*All Parts Ready Cut Out*

82" Span. Length 54½". 2" Scale. Weight 5½ lbs. with motor.

World's finest equipped and most perfect scale gas model

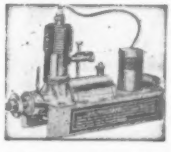
This is an exact scale model of the latest Army Vega, beautifully streamlined. A special de luxe flying gas model with all formers, wing ribs, lips, wheel pants, already cut out and notched. Turned balsa motor front, 4½" pneumatic air wheels, silk covering, army blue and yellow dope, glue, etc. Model has removable wing, and is specially designed for gas motor. It is very strong, practically crashproof —there being no exterior parts or struts to break. Takes off in 30 foot run, flies over 1 mile on ¼ oz. of gasoline. Const. set, complete without motor, postpaid $25.00

Also 5½ Foot Boeing F4B4 Gas Model Set, $25.00.

Catalogue. 8"x10" Illustrated. Send 3c Stamp.

**1/5 H. P. GAS MOTOR**

Weight as shown, 12 oz.



Long life motor has steel cylinder and piston, ⅞" bore x 1" stroke. Comes complete with gas tank, coil, condenser batteries. Price ready to run, complete, postpaid. **$22.50** Only.....

15" or 19" Laminated propeller .....$2.75

**MINIATURE AIRCRAFT CORP.,** 83 LOW TERRACE NEW BRIGHTON, N. Y.

**REGULAR MECHANICS COURSE**

Twenty weeks of over 600 supervised hours of training on Engines, Airplanes and Welding. Prepares for position as mechanics helper or forms basis for continuation with Master Mechanics course. Tuition $120.00.

**MASTER MECHANICS COURSE**

Covers both the curriculum of Regular Mechanics course of twenty weeks and thirty-two additional weeks of advanced training (52 weeks in all or over 1500 hours of supervised training) in the approved repair depot of the school in every phase of overhaul and repair of licensed airplanes and engines. Prepares for Bureau of Air Commerce Tests as licensed Airplane and Engine mechanic. Tuition $440.00.

INVESTIGATE BEFORE YOU INVEST

**SPECIAL OFFER**

**AVIATION MECHANICS TRAINING**

Prepare for a career in the fast growing Aviation Industry. Skilled mechanics are in greater demand than ever. Get started right. Only thorough instruction is productive. Make certain of proven training by enrolling for either a Regular Mechanics or Master Mechanics course at world renowned Roosevelt Aviation School, located on, and operated by, famous Roosevelt Field—America's Largest and Busiest Civil Airport. This internationally recognized institution is Government Approved for instruction for all classes of pilots and mechanics licenses.

Aviation is our business. Here at Roosevelt we have the organization, experience and equipment to teach you what you need to make it your business. Many of our graduates are holding responsible positions with airlines and at factories and airports. What we have done for others we can do for you. No previous technical knowledge is required.

Get started now by taking advantage of our marvelous special offer for complete, practical mechanical instruction taught in the professional manner in an ideal training atmosphere at less cost than for ordinary instruction.

Larger quarters and additional equipment make this offer possible! But you must act quickly! This offer is good only if you start on June 1st. It will not be extended. Get your reservation in at once for one of these classes.

For further information write or 'phone for booklet (PA) or visit

**ROOSEVELT AVIATION SCHOOL**

ROOSEVELT FIELD MINEOLA, N. Y.

# We Please All Flyers

*Whether It's a Clock or Plane*

***That's Why So Many Aviators Boost* AVIATION PRODUCTS**

***Look at these Values*** **FROM OUR NEW CATALOG**

Jane Ray, first woman State Aviation Inspector, a satisfied A. P. customer, and her letter. Read it.

CHICAGO GIRLS FLYING CLUB

February 8, 1936.

Aviation Products Co.
619 South Federal Street
Chicago, Illinois

Gentlemen:

We have just received the articles recently ordered and are delighted with them. They are to be used as prizes on our membership drive for the Illinois chapter of the 99ers and the prospect of winning one will have every girl striving her hardest.

The little engine clock is a darling and I want one for myself.

As we intend to have an "All Women" Air Race in Chicago this summer, we are especially interested in the new trophies you have described to us and if you will advise me, I will be glad to call in the near future to select the prizes for that event.

Sincerely yours,
Jane Ray

Pilot P - 30600
Pres., Chicago Girls' Flying Club
Chairman, Chicago Chapter 99ers

*Latest Style*

## PARACHUTE SILK SCARF

Made of genuine white parachute silk, these scarfs are a handsome addition to any flier's wardrobe. Attractive for dress, as well as important part of equipment. Log book given free with each order. Wear a genuine parachute silk scarf this spring. It's the latest style. Price only **$1.98.**

## HANDY MECHANIC'S GOGGLES

Great around the shop. Gives adequate eye protection. High quality, non-shatterable lense. Comfortable sponge rubber eye-masks. Used by mechanics, sportsmen, etc. Price only **$2.49.**

## SNUGFIT GOGGLES

Here is a good goggle with interchangeable lense, wide vision, sturdy construction. Specially moulded rubber cushions. Easy nose adjustment. Wide elastic head band. Price only **$2.59.** Ask for Snugfits.

## WIDE-VISION GOGGLES

**with Rubber Mask**

You can see in every direction. Built for more angular vision. Non-shatterable lense. Fitted with large soft rubber mask. Ventilated through frame. Ask for Style DEM Goggle. Price only **$4.98.**

## Write for Your Copy of the New Aviation Products Supply Catalog Today

**Free with your order or send a dime which will be refunded with your first order.**

It is chock-full of values. A large selection of helmets, goggles, instruments, supplies, etc.

Send for it TODAY

## FOR THE CAR - CLUB ROOM - OR DEN

### AIRPLANE TYPE AUTO COMPASS

Get this instrument for your car. It's the latest thing. Installed in one minute. Similar to Airplane compass being of the liquid type and having a rotating dial with jeweled pivot. A compensator is also given (not shown) to be placed under this instrument to offset magnetic effect of steel and electrical equipment in your car. Why take the wrong route? Know immediately whether your direction is right or wrong. Priceless on long trips. ORDER ONE TODAY. Price only **$1.59** complete with full instructions.

### AIRPLANE MOTOR MODEL CLOCK

This fine 6-inch model of a 9-cylinder aircraft engine fitted with reliable clock movement made of unbreakable metal with attractive chromium plated exhaust ring. Wind movement or electric movement. **Price $3.95.**

### PROPELLER CLOCK

**Electric or wind movement encased in beautifully finished propeller measuring 27 inches. A real ornament. Only $4.50.**

## AVIATION PRODUCTS CO.

**619 S. Federal St., Dept. PA-6, - CHICAGO, ILL.**

AVIATION PRODUCTS CO.

***Everything for the Aviator***

XUM

## Ford

(*Continued from page* 416)

sea and when about five hundred yards from shore, dived into the water. Witnesses said they could easily observe the pilot as he strove frantically to revive his balky motor. Attempts to reach the wreckage were considerably delayed due to a strong off-shore current and when would-be rescuers finally reached the little ship, Brooks was nowhere to be found.

It is generally believed that the young pilot endeavored to swim ashore and, miscalculating the speed of the off-shore current, was swept out to sea. His body was never recovered.

This unfortunate tragedy ended Ford's experiments with lightplanes for the time being. And, while it is significant that the crash was in no way caused by any failure traceable to the structural design of the plane, being a clear case of motor failure, the disastrous consequences had a profound effect upon Mr. Ford. His ardor remained dampened until recently.

Any mention of lightplane development in the Detroit area would be incomplete without some mention of Dean Hammond's latest bid for what the Bureau of Air Commerce fondly hopes will be a plane for the masses. Recently the Hammond pusher, the result of months of heart-breaking work by its modest and youthful designer Dean Hammond, successfully passed its A. T. C. requirements at Wayne County Airport.

We're really pleased that we can supply you lightplane fans with more detailed information on this ship than we could on the Ford. This, I might add, is due entirely to Mr. Hammond, the designer and genial J. H. Geisse, who superintended tests of the ship for the Bureau of Air Commerce.

Driving out to Wayne County Airport with Robert Ball, one of the Aviation Editors of the Detroit News, we were startled the first time we laid eyes on the recently re-designed and re-built Hammond. Nestled between a new Stinson Model-A tri-motor and a big tri-motored Ford of ancient vintage, our first glimpse of the ship was a profile view.

"Where's the wings?" I asked.

"Take another look," I was told.

I did. And found them very much in evidence, though they are mounted so low on this altogether unconventional airplane that one must know where to look for them.

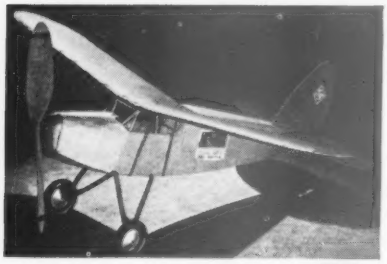
As originally designed, this ship failed to meet up with speed specifications. As a result, by dint of much work and the assistance of Lloyd Stearman, the plane now boasts a maximum approximating 130 miles-per-hour and a landing speed of thirty-five with flaps lowered. But we're getting ahead of our story.

The ship is beautifully finished, great attention having been given to detail both in the exterior and interior finishings. And by the way, this plane deserves being called something else besides a "light airplane" or beetle. As a matter of fact, it's in a class by itself.

The cabin, setting well forward of the center of gravity, is constructed entirely of metal, Ford tri-motor construction being followed. Thus, a maximum of strength combined with lightness is achieved.

The interior of the cabin, seating two persons side-by-side, with plenty of leg and head room, is finished on a scale comparable with any of the better-make automobiles. The instrument panel containing all the necessary instruments for


**NEW! Jimmie Allen**
**OFFICIAL MODEL FOR 1936 Air Races**



**Complete Construction Kit** **75c**

26 in. wing span; 20 in. overall length; min. weight 1 oz. High wing cabin model designed for duration. Free wheeling prop; shock-proof landing gear. Control surfaces adjustable, detachable. 75c at Skelly Oil stations. By mail, add 14c postage ($1 postpaid to Canada), from

COUNTRY CLUB AERO SUPPLY CO.
5921 Holmes St., Kansas City, Mo.



# Heath Lightplane Engines

**Have proved their worth by years of service in the hands of homebuilders and amateurs.**

HEATH lightplane engines have been thoroughly tested by hundreds of satisfied owners on all sorts of lightplanes. They are no experiment but have undergone a long period of development.

And, with this aviation history behind them and with many records to their credit, the price is so low that they can be purchased at an absolute minimum of cost.

It was because of this superb service given by the Heath engines that AVIATION PRODUCTS took over the exclusive distribution of these engines. They are reliable, light in weight, economical and are highly regarded by amateurs who know their engines. The statement that the "Heath B-4 gives pursuit performance to the lightplane", is no idle boast.

The Heath B-4 Engine

**SPECIFICATIONS HEATH B-4 ENGINE**

| | |
|---|---|
| No. Cylinders in-line | 4 |
| Gas consumption @ 2500 r.p.m. | 2 gal. per hr. |
| Government rating @ 2800 r.p.m. | 25 hp. |
| Cubic inch displacement | 83.0 |
| Compression ratio | 4.5 |
| Weight, dry | 119 lbs. |
| Height | 24" |
| Length | 25" |
| Width | 15" |
| PRICE F.O.B. BENTON HARBOR, MICH. | $195.00 |
| HEATH BIRCH METAL-TIPPED PROPELLER | 14.95 |

**SPECIFICATIONS HEATH REBUILT HENDERSON MOTORS**

| | |
|---|---|
| No. Cylinders in-line | 4 |
| Gas consumption @ 2750 r.p.m. | 1.5 gal. per hr. |
| Horsepower at 2750 r.p.m. | 23 |
| Horsepower at 3000 r.p.m. | 27 |
| Wt., dry, with propeller | 115 lbs. |
| Useful load carried | 350 lbs. |
| Top speed, plane or sled | 97 mph. |
| Ceiling | 18000 ft. |
| PRICE F.O.B. BENTON HARBOR, MICH. | $145.00 |
| HEATH SPRUCE CLOTH-TIPPED PROPELLER | 8.95 |

# AVIATION PRODUCTS CO.

*Sole distributors of Heath Engines*

619 So. Federal Street, Chicago, Ill.

regular and blind flying, is arranged simply and attractively.

Dual-controls, adjustable by the way, are of the conventional stick and pedal type. Unlike many light planes the control column is stationary, the second being removable if undesirable. There is a large compartment located directly behind the seat with accommodations for eighty pounds of baggage.

Visibility is excellent, the forward position of the cabin reminding us of those dear, dead days when we gallantly rode astride the well-ventilated cockpit of a primary glider. This also brings to mind the subject of landing gears. The Hammond is equipped with the conventional oleo type gear, the rear wheels being mounted well behind the center of gravity and carrying most of the weight. The front wheel, with its lighter load, makes steering on the ground easy. All three wheels wear pants and are equipped with hydraulic brakes.

Wing construction is of the full-cantilever, multi-cellular type. They are constructed of a frame-work of metal, covered with fabric. The ailerons, carrying outside counterbalancers to overcome any tendency towards flutter, are likewise constructed of metal, but unlike the wings, are metal covered.

The wing-flaps, horizontal and vertical fins are also covered with metal, while the rudders, of which there are two, are of metal construction, and covered with fabric. The tail group on the new Hammond has been altered considerably from the original. Both booms connecting the tail group with the rear wing spars have been beefed up by the substitution of metal, monocoque construction in place of the original cloth covered tubular booms.

The engine, a business-like Menasco, of the 4-cylinder inverted, air-cooled variety, develops 125 h.p. It is tied to a Hartzell, wooden propeller. The engine mounting is neatly faired into the cabin, being located above and to the rear of the passenger compartment.

Air for cooling is scooped up in a tunnel-like opening directly above the cockpit. It flows past the cylinders then out a narrow aperture at the rear. Thus, the whole effective area of the propeller operates in what is practically undisturbed air.

But we got our greatest thrill when we watched the ship take the air easily and gracefully. Aided by a fairly strong icy blast that kept us inside our heated car, it rose after what seemed an incredibly short run, pushing its nose upwards at an alarming angle. However, Dean Hammond assured us that the test pilot wasn't pushing her for altitude. The ship has a nice climbing rate of nine hundred feet per minute.

In the air the plane exhibits unusually stable flying characteristics. Loaded, it absolutely refuses to spin, while with load light it will describe two complete turns with difficulty, then snap out of its own accord.

"In a stall she handles beautifully," states J. H. Geisse, Bureau inspector. "All she does is drop her nose into a gentle glide."

This, he explains, is due to the cabin being located well forward of the center of gravity.

All in all we're watching the development of this airplane with considerable interest. With all the advantages of the light plane and none of its disadvantages it is, as remarked earlier in this article, in a class by itself. The Hammond looks like what the Doctor ordered; a plane we can all fly

END.


## AN EDUCATIONAL OPPORTUNITY IN AERONAUTICS

If you are a young man with a capacity for mathematics and an earnest desire to identify yourself with a gainful occupation in aeronautics, one of the leading manufacturers of metal airplanes for the civil market offers to a limited number of qualifying men the following:

A practical course in shop practice and details of business on an apprenticeship basis paying $15 weekly to men who will accept tutoring concurrently in aeronautical engineering under the guidance of one of the foremost educators of an important university. The cost of the tutoring is $100 monthly for six months.

Qualifying candidates may continue their courses without further charge beginning with the seventh month with apprenticeship salaries for their shop work then based on actual worth.

Interested parties will state qualifications when requesting further information.

Box 100—c/o Popular Aviation
608 S. Dearborn, Chicago.

# MR. DEALER!

## LET'S GET DOWN TO BRASS TACKS!

If 18" lengths are desired, take ½ of 36" length price.
If 3" widths are desired, double price of 2" widths sheet Balsa. Thinner same price as clear dope.

**BALSA**
**36" LENGTHS PER 100**

| | |
|---|---|
| 1/32x1/16 | 10c |
| 1/16x1/16 | 10c |
| 1/16x3/32 | 18c |
| 1/16x1/8 | 19c |
| 1/16x3/16 | 24c |
| 1/16x1/4 | 26c |
| 1/16x1/2 | 50c |
| 3/32x3/32 | 24c |
| 1/8x1/8 | 29c |
| 1/8x3/16 | 48c |
| 1/8x1/4 | 52c |
| 3/16x3/16 | 85c |
| 1/4x1/4 | 80c |
| 1/4x1/2 | $1.50 |
| 1/2x1/2 | 2.15 |

**36" PLANS**
Scale craft flyer plans with movable controls: Post-Rogers Lockheed or the Monocoupe, $1.50 per doz. or $9.00 per hundred.

**36" SHEETS**

| | |
|---|---|
| 1/64x2 | 10 for 14c |
| 1/32x2 | 10 for 14c |
| 1/16x2 | 10 for 17c |
| 3/32x2 | 10 for 20c |
| 1/8x2 | 10 for 22c |
| 3/16x2 | 10 for 31c |
| 1/4x2 | 10 for 40c |
| ½x2 | 10 for 75c |

**BALSA PLANKS**
**36" Lengths**

| | |
|---|---|
| 1x1, each | 6c |
| 1x1½, each | 9c |
| 1x2, each | 15c |
| 1x3, each | 20c |
| 1x6, each | 35c |
| 1¼x1½, each | 25c |
| 2x2, each | 25c |
| 2x3, each | 35c |
| 2x4, each | 45c |
| 2x6, each | 60c |
| 3x6, each | $1.25 |

**COLORLESS CEMENT**

| | |
|---|---|
| 1-oz. bots., ½ doz. | 23c |
| 2-oz. bots., ½ doz. | 40c |
| 4-oz. bots., ½ doz. | 70c |
| 1 pt., each | 45c |
| 1 qt., each | 75c |
| 1 gallon, each | $2.00 |

**CLEAR DOPE OR BANANA OIL**

| | |
|---|---|
| 1-oz. bots., ½ doz. | 23c |
| 2-oz. bots., ½ doz. | 40c |
| 4-oz. bots., ½ doz. | 70c |
| 1 pt., each | 40c |
| 1 qt., each | 65c |
| 1 gal., each | $1.75 |

Thinner same price as clear dope.

**JAPANESE TISSUE**
White, per doz. 12c
Colored, asst., per doz. 15c
All colors.
Silver, per doz. 21c

You sell airplane supplies in order to make money. The House of Diamond is in business to help you make money. We give you the finest quality possible and we endeavor to sell at the lowest possible wholesale price. In addition we give you the fastest service in the business. There may be occasions when a competitor may undersell us on individual items to the extent of a penny or two—but do not let such trifles blind you to the fact that Diamond gives you WHAT you want when you want it. Diamond will never sacrifice quality in order to create a false "bargain". Buy from Diamond, the House of Reliability. Send for our new 1936 Catalog which is just off the press.

**STANDARD PITCH BALSA PROPELLER BLOCKS**
**Per Dozen**

| | |
|---|---|
| ¼x¾x5 | 5c |
| ¼x¾x6 | 6c |
| ¾x1x7 | 14c |
| ¾x1x8 | 18c |
| ¾x1x9 | 25c |
| ¾x1½x10 | 30c |
| ¾x1¼x12 | 35c |
| 1x1½x12 | 40c |
| 1x1½x15 | 55c |

**BAMBOO**
1/16 sq. x 14, 1 gross for 20c
1/16x¼x11, 1 doz. for 5c

**REED**
1/32 or 1/16 dia., 50 ft. for 18c
3/32 or ⅛ dia., 50 ft. for 20c

**ALUMINUM COWLING**
**Closed or Open**

| | |
|---|---|
| 1½" dia., 3 for | 25c |
| 2" dia., 3 for | 35c |
| 2½" dia., 3 for | 43c |
| 3" dia., 3 for | 55c |
| 4" dia., 3 for | 80c |

**FRESH PARA RUBBER**
**AAA GRADE**
**Per 225' skein**

| | |
|---|---|
| 1/32 sq. | 25c |
| .045 sq. | 35c |
| 3/32 flat | 35c |
| 1/8 flat | 40c |
| 3/16 flat | 70c |
| Lb., any size | $1.00 |

**DOWELS**

| | |
|---|---|
| 1/16" dia. x 12", 100 for | 55c |
| 25 for | 20c |
| 1/8" dia. x 36", 100 for | $1.50 |
| 25 for | 45c |
| 3/16" dia. x 36", 100 for | $2.25 |
| 25 for | 75c |
| ¼" dia. x 36", 100 for | $3.00 |
| 25 for | 1.00 |

**SHEET CELLULOID**
**(Transparent)**

| | |
|---|---|
| 12½x16, each | 19c |
| 6x8, doz. | 65c |

**INSIGNIA SHEET**
12 pr. & rudder and tail markings with gummed back.
Doz., 36c; 100, $1.75

**DUMMY RADIAL ENGINES**
(Celluloid, 9 cylinders)

| | |
|---|---|
| 1½" dia., ½ doz. for | 80c |
| 2" dia., 3 for | 65c |
| 3" dia., 3 for | 65c |

**CELLULOID MOTOR AND DRAG RING COMBINED**

| | |
|---|---|
| 1½" dia. | 3 for .40 |
| 3" dia. | 3 for .75 |

**NOSEPLUGS, HARDWOOD**

| | |
|---|---|
| 1 doz. | 5c |
| 100 | 40c |

**CELLULOID WHEELS**

| | |
|---|---|
| ¾" dia., per doz. | 24c |
| 1" dia., per doz. | 25c |
| 1½" dia., per doz. | 35c |
| 1¾" dia., per doz. | 60c |

**BALSA BALLOON WHEELS**
(Machine Turned)

| | |
|---|---|
| ½" dia., per doz. | 9c |
| ¾" dia., per doz. | 11c |
| 1" dia., per doz. | 14c |
| 1½" dia., per doz. | 19c |
| 1¾" dia., per doz. | 38c |
| 3" dia., per doz. | 85c |

**BIRCH WHEELS LIGHT AND STRONG**

| | |
|---|---|
| ½" per doz. | 5c |
| ¾" per doz. | 6c |
| 1" per doz. | 8c |
| 1¼" per doz. | 10c |
| 1¾" per doz. | 15c |

**BRASS BUSHINGS OR EYELETS**
**Per 100**

| | |
|---|---|
| 1/16 diam. | 12c |
| 3/32 diam. | 15c |
| 1/8 diam. | 18c |

**THRUST BEARINGS**
**(Hard Steel)**
Small, per dozen 6c
Small, per gross 55c
Large, per dozen 7c
Large, per gross 70c

**WASHERS PER 100**

| | |
|---|---|
| ⅛ brass O. D. | 5c |
| ¼ copper O. D. | 5c |

**WIRE PER 100 FT.**
**(Straight Lengths)**

| | |
|---|---|
| No. 6 | 15c |
| No. 8 | 18c |
| No. 10 | 20c |
| No. 12 | 23c |
| No. 14 | 26c |

**SHEET ALUMINUM**
**Per 5 ft.**

| | |
|---|---|
| .002 thick | 35c |
| .005 thick | 50c |
| .010 thick | 75c |

**ALUMINUM TUBING**
(Special) 1/100" wall)

| | |
|---|---|
| 1/16 O.D., 5 ft. | 30c |
| 3/32 O.D., 5 ft. | 32c |
| 1/8 O.D., 5 ft. | 32c |
| 3/16 O.D., 5 ft. | 40c |
| 1/4 O.D., 5 ft. | 45c |

**COLORED DOPE**
White, yellow, orange, blue, red green, olive, drab, black, silver, gold or gray.

| | |
|---|---|
| 1-oz. bottles, per ½ doz. | 30c |
| 2-oz. bottles, per ½ doz. | 55c |
| 4-oz. bottles, per ½ doz. | $1.00 |
| 1 pt. each | 50c |
| 1 qt. each | 85c |
| 1 gallon, each | $2.25 |

**SANDPAPER**
**5 Pieces to the Pack**
Per doz. pkgs. 25c

**HIGH GLOSS**
To shine up colored models.

| | |
|---|---|
| 1-oz. bottles, per ½ doz. | 30c |
| 2-oz. bottles, per ½ doz. | 55c |
| 4-oz. bottles, per ½ doz. | $1.00 |

**CELLULOID PANTS**

| | |
|---|---|
| For ⅝" or 1" wheels, ½ doz. | 50c |
| For 1⅜" or 1⅞" wheels, ½ doz. | 75c |

**¾ FINISHED BALSA WHEEL PANTS**
Ready for final sanding

| | |
|---|---|
| To fit: | 6 pr. |
| ½" wheels | 36c |
| ¾" wheels | 36c |
| 1" wheels | 36c |
| 1⅜" wheels | 54c |
| 1⅞" wheels | 54c |

**PROP SHAFTS**
**(Hard Steel)**
One size fits all models

| | |
|---|---|
| Per dozen | 10c |
| Per gross | 75c |

**REAR HOOKS**
**(Hard Steel)**
One size fits all models

| | |
|---|---|
| Per dozen | 10c |
| Per gross | 75c |

**DIE-CAST BOMBS**

| | |
|---|---|
| ¾" long, 3 for | 10c |
| 1¼" long, 3 for | 20c |
| 2" long, 3 for | 35c |

**PURSUIT or SWIVEL MACHINE GUNS**
**(DIE CAST)**

| | |
|---|---|
| ¾" long, 3 for | 10c |
| 1" long, 3 for | 15c |
| 1¾" long, 3 for | 25c |

**2-BLADED PROPS**
**(DIE CAST)**

| | |
|---|---|
| 1½" long, 3 for | 20c |
| 2½" long, 3 for | 35c |
| 3½" long, 3 for | 45c |
| 4½" long, 3 for | 55c |

**3-BLADED PROPS**
**(DIE CAST)**

| | |
|---|---|
| 1½" long, 3 for | 25c |
| 2½" long, 3 for | 35c |
| 3½" long, 3 for | 50c |
| 4½" long, 3 for | 60c |

**DIE-CAST WING AND TAIL LIGHTS**
3 Pcs. to a Set

| | |
|---|---|
| For 12" model, 3 sets | 20c |
| For 15" model, 3 sets | 40c |
| For 24" model, 3 sets | 90c |

**MODEL PINS**
Per doz. pkgs. 35c

**MACHINE CUT PROPS**

| | |
|---|---|
| 5" per doz. | 30c |
| 6" per doz. | 38c |
| 7" per doz. | 48c |
| 8" per doz. | 50c |
| 10" per doz. | 65c |
| 12" per doz. | $1.00 |

**WOOD VENEER**
(For scale model work)
20"x30", 3 sheets for 25c

**GENUINE SUPER-FINE TISSUE**
(Cover your champion endurance ships with this paper.)
18x24, per doz. 75c

**ALUMINUM LEAF**
.0003 of an inch thick.
3½" wide, 100 ft. for 35c

**FRESH RUBBER**
**A GRADE**

| | |
|---|---|
| 3/32 flat, skein 250 ft. | 20c |
| ⅛ flat, skein 250 ft. | 25c |

**FREE DEAL**

**A Big Bonus for a Limited Time Only!**

With each order for $2.50 or more of supplies we give free skein of para rubber; regular wholesale price 40c; retail value $1.40 FREE! With each order for $5.00 or more of supplies we give Free—1 skein of para rubber and 2 dozen large insignia sheets. Wholesale price $1.17; retail value about $4.00.

**FREE CATALOG**
Just off the Press! Listing everything and anything you may need in model airplane kits and supplies. Everything at rock bottom prices. Get yours today.

**HOW TO ORDER**
No orders under $2.50 . . . all orders shipped express collect at these low prices.

**DIAMOND**
**Model Mfg. Supply Co.**
915A6 Saratoga Av. Brooklyn, N. Y.

## Cyclone "G"

(*Continued from page 420*)

It consists of small bronze counterweights, having a free play of ⅛-inch attached to the shaft. It is believed that the perfection of this engineering problem will practically eliminate propeller shears, crankcase, and crankshaft failures.

Lubrication presented another intricate problem. Methods in the past have proven practical but not thoroughly satisfactory. A new type controlled pressure lubrication of the valve gear has been installed which is operated by a hand valve attached to the main oil pump. This eliminates the cumbersome removal of the engine cowling and the time-wasting lubrication of the rocker arms. This "one shot system" permits the lubrication of all valve mechanism by opening the hand valve for 15 seconds. This development should be enthusiastically welcomed by mechanics who have had to spend hours at this task in the past.

Two engines of this type have been installed in the huge new Douglas sleeper transport and extensive testing has been made possible. Officials of the Douglas company state that fuel consumption is as low as that of the Diesel engine, long regarded as the most economical type. A newly developed fuel injection system has been installed which accounts for the low consumption.

The Cyclone "G," totally assembled and "dry," weighs only 1,100 pounds. This is a remarkable achievement as, considering its 1,000 horsepower, it closely approaches the "ideal" aircraft engine weight of one pound per horsepower.

Long a goal of aeronautical engineers, the 1,000 horsepower engine seems to have arrived on several fronts. Although a great deal more than 1,000 horsepower has been developed by aircraft engines in the past, they were experimental types and were never used to any extent. In England, the Rolls-Royce "Merlin" inline liquid cooled engine has been accepted as developing 1,000 horsepower. This is the engine used to power the latest Hawker monoplane, a sensational 300 mile-per-hour fighter developed for the British Air Ministry.

In this country, the Pratt & Whitney Corporation, East Hartford, Connecticut, the world's second largest plant and largest in production figures, claim 1,000 horsepower for their new "Twin Wasp," a double row type also under tests at present. Kinner's mysterious "Twin Row" engine exhibited at the Pacific Aircraft Show also boasts of 1,000 horsepower. Still another, the Allison Corporation, Cleveland, Ohio, has produced an experimental liquid cooled engine which approaches the magical 1,000 horsepower figure.

However, the Cyclone "G" is the first to prove, under actual tests, its horsepower and to be made available in production quantities.

## Stress Analysis

(*Continued from page 430*)

$$F = \frac{W \times V^2}{2g \times D}$$

Where (D) is the distance in feet through which the body comes to rest after the retarding effect is first applied. The published equation, following, is in error by the accidental omission of (D).

$$F = \frac{W \times V^2}{2g}$$

Which, of course, represents energy and not force. Beg your pardon. In order that the roster of force equations be complete, we attach the following collection involving all of the quantities involved in the computation of force.

Let:
G = acceleration in feet per second per second.
V = final velocity in feet per second.
S = distance in feet.
W = weight in pounds.
F = force in pounds due to momentum.
g = 32.16, gravitation acceleration.
T = time in seconds.
K = work in foot-pounds.
P = average power expenditure during the time (T).
m = mass.

Then:

$$F = \frac{G \times W}{g} = \frac{V \times W}{g \times T} = \frac{2 \times W \times S}{g \times T^2} =$$

$$= \frac{W \times V^2}{2 \times W \times S} = \frac{P \times T}{S} = Gm =$$

$$= \frac{2 \times K}{G \times T^2} = \frac{K}{S}$$

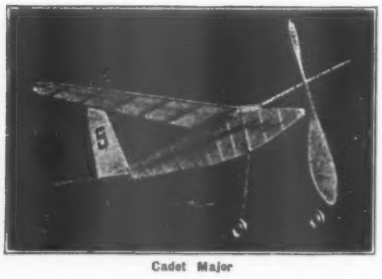
END.

**FUTURE FLYERS OF AMERICA!**
● Write me for complete information on how to join the Future Flyers of America—a live and growing organization of future men of the air!
KEEP UP TO DATE—INFORMATION ON REQUEST. GIVE AGE.
**PILOT JOHN W. HUFF, 926 N. BLVD., OAK PARK, ILL.**

**4000 FLIGHTS 5 YEARS' EXPERIENCE**
**WITH GAS MODELS**

Gwin Aero Motor

Scorpion Major


Cadet Major

**The Bunch Engineering Staff** is proud to present these masterpieces of gas model engineering. The Gwin Aero Engine is designed expressly for airplane flying and incorporates features which thousands of flights have shown desirable and necessary for greatest success. Easy starting, durability, great strength, wide speed range and ability to run in any flight position. This engine is precision manufactured and built of finest steel and aluminum alloys accurately heat treated. No die cast or pot metal parts are used. Each engine is block tested by expert mechanics and guaranteed to run and run right. Use a Gwin Aero in your airplane and have flights made possible by the unparalleled experience of the Bunch Engineering Staff. Specifications: Flying weight complete with batteries 18 oz. Height 4¼". Bore ½". Stroke ½". Speed Range 800 to 6500 RPM.

The Scorpion Major Gas model is designed to present to the public a truly outstanding gas model. An airplane of advanced structural and aerodynamical design yet easy to build. The Bunch Company has earned the designation—Home of Championship Airplanes—and as such is proud to introduce this remarkable new airplane. Specifications: Span 57"; full shock absorbing landing gear; airwheels; beam type motor and battery mount; adjustable rudder, C.G. and incidence. Drawings full detailed and instructions cover complete building and flying information—how to make fast or slow flights—turns—and how to make the ship climb up in turns under power then glide in slow flat spirals landing close to take off point. The Scorpion Major is designed expressly for the Gwin Aero motor and with this engine full advantage can be taken of its marvelous speed range, however, other engine types of similar size may be used.

We are showing also the famous super-duration 30" span Cadet Major (rubber power). For pleasure and contest flying. The best duration model of the year.

**PRICES:**
GWIN AERO MOTOR. Postpaid.....$17.50
Complete with Coil, Tank and Condenser
GWIN AERO PROPELLER. Postpaid.....$2.00
SCORPION MAJOR. Complete Kit less motor $12.50 Plus $1.00 Postage
SCORPION MAJOR PLANS. Postpaid.....$2.50
CADET MAJOR (rubber power). Complete Kit Postpaid.....$1.50
CADET Jr. (rubber power). Complete Kit 50c Plus 10c Postage
Both CADET Kits. Postpaid.....$2.00
Catalogue (rubber power), 3c Stamp. Catalogue, Gas Motors and Models 3c

**BUNCH MODEL AIRPLANE CO.**
2303 S. Hoover St. Los Angeles, Calif.
*Thousands of happy, satisfied customers.*

# Accountancy Home-Study

## made *interesting* and *practical* thru *problem method*

YOU know as well as we do that Accountancy fits many men for positions that pay three and five and ten thousand dollars a year—gives many other men unusual opportunity to start a profitable growing business of their own.

You probably realize also that—because of the new state and federal legislation—the accounting profession faces now and for the next few years the greatest opportunity it has ever had.

The only question is—just how practical is it for *you* to train yourself adequately in Accountancy through home study?

And the answer lies in the LaSalle Problem Method.

For this modern plan of training not only makes Accountancy study at home thoroughly practical but makes it interesting as well.

And here's how:

### *You Learn by Doing*

Suppose it were your privilege every day to sit in conference with the auditor of your company or the head of a successful accounting firm. Suppose every day he were to lay before you in systematic order the various problems he is compelled to solve, and were to explain to you the principles by which he solves them. Suppose that one by one you were to work those problems out—returning to him every day for counsel and assistance—

Granted that privilege, surely your advancement would be faster by far than that of the man who is compelled to pick up his knowledge by study of theory alone.

Under the LaSalle Problem Method you pursue, to all intents and purposes, that identical plan. You advance by solving problems.

Only—instead of having at your command the counsel of a single individual—one accountant—you have back of you the organized experience of the largest business training institution in the world, the authoritative findings of scores of able accounting specialists, the actual procedure of the most successful accountants.

Thus—instead of fumbling and blundering—you are coached in the solving of the very problems you must face in the higher accounting positions or in an accounting practice of your own. Step by step, you work them out for yourself—until, at the end of your training, you have the kind of ability and experience for which business is willing and glad to pay real money—just as it was glad to pay these men.*

### *Five Men Who Tested and Proved It for You*

For instance, there was the man who started Accountancy training with us in 1916. After a short period of study, he took a position as bookkeeper for a year, and then became accountant for a leading automobile manufacturer—with two bookkeepers under him. Today he is auditor of one of the foremost banks in his state and his salary is 325 percent larger than when he started training.

He writes, "*My training is the best investment I've ever made, showing a cash value running into five figures.*"

And the young clerk, earning $75 a month eleven years ago and now getting many times that as general auditor for an outstanding, nation-wide organization. Within six months after he began our training, he was earning $125 a month and within four years, he was earning $250.

Do you wonder that he writes, "*While LaSalle ads once seemed like fairy tales to me, now I know from personal experience that they are true*"?

Or let us tell you about two men—one a stenographer and the other a retail clerk—neither of whom knew more than the simplest elements of bookkeeping. One is now the comptroller and the other the assistant comptroller of a large company.

"*LaSalle training in Higher Accountancy,*" write both, "*was the important factor in our rapid climb.*"

And if you are thinking about the C. P. A. degree and a public accounting business of your own, read about the pharmacist who was earning $30 a week eleven years ago when a LaSalle registrar secured his enrollment for Accountancy training. Eight months later he left the drug store to take a bookkeeping job at $20 a week—less money but larger opportunity. Three years later he passed the C. P. A. examination and a year later yet he was earning $5,000 a year. Now he has his own highly successful public accounting firm for which he says, "*My LaSalle training has been largely responsible.*"

**Send for This Book**

*Names and addresses given on request.

### *One-Tenth of All C. P. A.'s Are LaSalle Trained*

If you want still more proof, remember that 1,350 C. P. A.'s—approximately one-tenth of all those in the United States who have ever passed the difficult examination for this coveted degree—are LaSalle trained.

And knowing these facts, ask yourself if there can be any further question about the practicability of this training for you—ask rather if the real question is not about the size of your own ambition and the quality of your determination.

For Accountancy is no magic wand for the lazy or the fearful or the quitter—it offers success only to the alert adult who has the courage to face the facts and the will to carry on till the job is done.

If you are that individual, the coupon below, filled out and mailed, will bring you free the information that can open up to you the future of which you have dreamed—ability and income and success.

Is it not worth getting that information?

## LaSalle Extension University

LaSALLE EXTENSION UNIVERSITY, Dept. HR-288, Chicago, Ill.
Please send me, free of all cost or obligation, your 64-page, illustrated book, "Accountancy, the Profession That Pays," telling about the profession of accountancy and your training for success in that field.

Name.....

Address.....City.....

Position.....Age.....

BOSTON PUBLIC LIBRARY
DEPARTMENT OF TECHNOLOGY

## Model

(*Continued from page 437*)

### TESTING AND FLYING

Two types of propellers are used on this model. One, which has a wide blade, is made of fiber. This type of blade causes the motor to turn at less r.p.m. and greater flights result. By twisting the blades the pitch can easily be adjusted. The balsa scale propeller is used for exhibition purposes only. Six strands of ⅛ flat rubber are sufficient to fly the model.

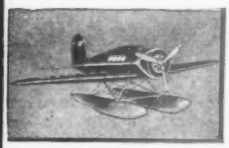
With the rubber motor and flying propeller in place, gently launch your model over tall grass. By this method you can see if your model is properly balanced. If model glides a short distance and nose rises abruptly, it will be necessary to add weight to the bottom of nose block. If model dives, add weight to tail. After the model is balanced to glide on an even angle, you are ready to test your model under power. In making test flight, the principal thing to avoid is possible damage. Gliding and flying it over tall weeds is the safest because the weeds or tall grass break the fall gently in case the model should stall or dive.

A few trial flights will acquaint you with the ship and all other adjustments can be made through the adjustable control surfaces.

END.


# QUALITY FOREMOST!

**From the 48 States orders come to Heathe. From Australia and New Zealand at the bottom of the world, from England, from far away Shanghai, model builders insist upon Heathe Kits and supplies. With the whole world to choose from why is it that these builders buy from Heathe. There can be but one answer . . . . Heathe quality cannot be duplicated at our lowest possible prices. Try us and see for yourself!**



**POST-ROGERS LOCKHEED**
a 3 ft. Scale Craft Flyer: a fitting souvenir of these two great immortals . . . . complete with aluminum cowl, carved prop, printed wood simplified plans, etc. . . . only **$1.50** plus 25c postage.

## GAS MODEL BUILDERS

Here's what you've been waiting for . . . . a catalog and handbook of Accessories for constructing record-breaking gas models. Written by champions. Contains gas model hints, photos of champions and their models, success stories of their championship flights. Free—but will appreciate 3c postage for handling!

**MONOCOUPE "145"**
a 3 ft. Scale Craft Flyer: a model you would be proud to own . . . . make this your next model . . . . complete with aluminum cowl and carved prop, etc. . . . only . . . . **$1.25** . . . . 25c postage.

## TYPICAL VALUES from the MODEL BUILDERS "BIBLE"

**BALSA WOOD**
(If 36" lengths are desired just double 18" price)

**18" BALSA STRIPS**
1/32x1/16..100 for .05
1/16x1/16..100 for .05
1/16x1/8 ..25 for .05
1/16x3/16..20 for .05
1/16x1/4 ..17 for .05
3/32x3/32..21 for .05
1/8 x1/8 ..20 for .05
1/8 x3/16..14 for .05
1/8 x1/4 ..10 for .05
1/8 x3/8 .. 8 for .05
3/16x3/16..10 for .05
3/16x1/4 .. 8 for .05
3/16x3/8 .. 6 for .05
1/4 x1/4 .. 8 for .05
1/4 x3/8 .. 5 for .05
1/4 x1/2 .. 4 for .05
1/2 x1/2 .. 3 for .05

**18" BALSA PLANKS**
1" x 1" ..1 for .07
1" x 1½" ..1 for .09
1" x 2" ..1 for .11
1" x 3" ..1 for .15
1" x 6" ..1 for .25
1½"x 1½" ..1 for .15
2" x 2" ..1 for .20
2" x 3" ..1 for .25
2" x 6" ..1 for .45
3" x 3" ..1 for .40
3" x 6" ..1 for .75

**COLORLESS CEMENT**
1 oz....05 2 oz....08
4 oz....15 1 pt....50

**BAMBOO**
1/16 sq. x 12" 35 for .05
1/16x¼x11 ..1 for .01
1/16x1/4x11 12 for .07

**SANDPAPER**
Per package .... .05

**18" BALSA SHEETS**
1/64 x 2 ...5 for .10
1/32 x 2 ...7 for .10
1/16 x 2 ...7 for .10
3/32 x 2 ...6 for .10
1/8 x 2 ...5 for .10
3/16 x 2 ...4 for .12
1/4 x 2 ...3 for .11
1/2 x 2 ...2 for .12

**BALSA PROPELLER BLOCKS**
⅛x ¾x 5 ..7 for .05
⅛x ¾x 6 ..7 for .05
⅝x1 x 7 ..3 for .05
⅝x1 x 8 ..2 for .05
¾x1¼x10 ..1 for .03
¾x1¼x12 ..1 for .04
1 x1½x12 ..1 for .06
1 x1½x15 ..1 for .07

**COLORED DOPE**
White, yellow, orange, red, green, olive drab, blue, black, silver, gold.
1 oz. ..... .05
2 oz. ..... .10
4 oz. ..... .19
1 pint (16 oz.)... .60

**CLEAR DOPE**
1 oz. ..... .05
2 oz. ..... .07
4 oz. ..... .13
1 pint (16 oz.)... .45

**THINNER SAME PRICE AS CLEAR DOPE.**

**FINEST PARA RUBBER**
1/32 x 1/32 30 ft. .05
225 ft. skein..... .30
.045 square 20 ft. .05
225 ft. skein..... .40
3/32 flat 20 ft... .05
225 ft. skein..... .55
1/8 flat 17 ft..... .05
225 ft. skein..... .80
3/16 flat 12 ft... .05
225 ft. skein..... .80

**SHEET CELLULOID**
3x5 .. .05; 6x8.. .08

**FLANGED BUSHINGS**
Doz.
1/16 diam. x 5/32 .05
1/16 diam. x 7/32 .08
3/32 diam. x 1/4 .10
1/8 diam. x 1/2 .20

**ALUMINUM LEAF**
(.0003 of an inch in thickness. 3½ wide) 5 feet for..... .05

**SHEET ALUMINUM**
Thickness
.002" 6x6 ...1 for .04
.003" 6x6 ...1 for .05
.010" 6x6 ...1 for .06

**JAPANESE TISSUE**
(White)
2 for 5 Per doz. .18

**COLORED TISSUE**
2 for 5; 1 doz.... .20

**MUSIC WIRE**
(straightened)
.014, .020, .028, .034
6 feet ..... .03

**THRUST BEARINGS**
(small or large)
Each ..... .01½
Per dozen .... .15

**MODEL PINS**
Per package..... .05

**DOWELS**
1/16 dia. x 10" doz. .09
1/8 dia. x 18" 2 for .03
3/16 dia. x18..1 for .03
¼ dia. x18..1 for .04

**REED**
1/16" diam. 10 ft. .05
3/32" diam. 8 ft. .05
1/8" diam. 6 ft. .05

**INSIGNIA SHEET**
12 pr. and Rudder and Tail markings, with gummed back. each only..... .05

**WASHERS**
1/8 O.D. Per doz. .01
Per gross ..... .10
1/4 O.D. Per doz. .01
Per gross ..... .10

**BALSA BALLOON WHEELS**
(Machine Turned)
½" diam. per pr.. 3c
¾" diam. per pr.. 4c
1" diam. per pr... 5c
1⅜" diam. per pr. 7c
1⅞" diam. per pr. 12c

**CELLULOID PANTS**
For ⅜" or 1" wheel 15c
For 1⅜" or 1⅞" wh. 30c

**ALUMINUM TUBING**
1/16" O.D. per ft.. 9c
3/32" O.D. per ft.. 7c
1/8" O.D. per ft.. 8c
3/16" O.D. per ft..10c
1/4" O.D. per ft..10c

**CELLULOID WHEELS**
¾" dia. pr..... 5c
1" dia. pr..... 7c
1⅜" dia. pr.....10c
1⅞" dia. pr.....16c

**DUMMY RADIAL ENGINES**
1½" dia. .....18c
2" dia. .....23c
3" dia. .....34c

**CELLULOID MOTOR AND DRAG RING COMBINED**
1½" dia. .....each .15
3" dia. .....each .35

**CAST PEDESTALS**
for all size solid models
Each .....10c

**MODEL BUILDERS RAZOR KNIFE**
Each .....10c

**BOMBS**
¾" long..... 4c ea.
1¼" long..... 9c ea.
3" long.....14c ea.

**2 BLADED PROPS**
1½" ..... 9c ea.
2½" .....14c ea.
3½" .....18c ea.
4½" .....20c ea.

**BAMBOO PAPER**
2 sheets for..... .15

**3 BLADED PROPS**
1½" .....10c ea.
2½" .....15c ea.
3½" .....20c ea.
4½" .....25c ea.

**PURSUIT MACHINE GUNS**
ea.
¾" Pursuit Gun 5c
1" Pursuit Gun 5c
1¾" Pursuit Gun 10c

**SWIVEL GUNS**
¾" long..... 5c ea.
1" long..... 5c ea.
1¾" long.....10c ea.

**DIE CAST WING AND TAIL LIGHTS**
3 pc. to a set for
12" model.....10c ea.
15" model.....20c ea.
24" model.....30c ea.

**MOTOR NOSE PLATES**
For 1½" motor 10c ea.
For 2" motor 15c ea.
For 3" motor 20c ea.

**ALUMINUM COWLINGS**

| Size | Anti-drag | Open | Closed |
|---|---|---|---|
| 1½" | 20c | 20c | 20c |
| 2" | 25c | 25c | 25c |
| 2½" | 28c | 30c | 30c |
| 3" | 30c | 35c | 35c |

**BALSA PROPS**
5" ..... 5c
6" ..... 6c
7" ..... 7c
8" ..... 8c
10" .....10c
12" .....12c

**FREE**
With every order of $1.50 or over, 250 ft. of the finest fresh ⅛ flat Para Rubber, free. Add 10c for handling charge of Free Rubber. Free supplies with all other orders.

**How to Order—**
Add 15c to orders under $1.50. Orders over $1.50 add 10% of order. Canada 10% extra. 36" lengths 10c extra. Add 10c for packing charge of free rubber.

*Dealers, Clubs: Send for Latest Discounts*

**HEATHE MODEL AIRPLANE CO.**
**438-A6 East 98th St.-Brooklyn, N. Y.**


## Doug Davis

(*Continued from page 419*)

male competitors in the Frank Phillips Trophy race, feature contest of the international events, collapsed in midair.

She crashed in a field to the Southeast of Curtiss airport at Glenview, Ill., on the outskirts of Chicago, bringing to a tragic end the day which had seen Jimmy Wedell set his new world's landplane record of 304.98 miles an hour.

Miss Klingensmith had just observed her 26th birthday the day before by winning second place in the women's free-for-all, which May Haizlip, flying wife of flying Jimmy Haizlip and at that time holder of the women's world speed record, won.

Only an hour or so before the Phillips race, Miss Klingensmith had observed to the crowd with bravado that she was going "to show the men a girl can do some flying too."

It was the first time a woman had ever entered a major air-race for men—and the last to date as well, because women were later ruled out of the competitive events at the National Air Races. As is known, they rebelled, held their own meet at Dayton, O., in protest, and there Frances Marsalis, coholder of the world's endurance record, was killed flying a borrowed airplane.

It was these accidents to their pals, to the men and women whom they knew best in everyday life, that permeated the atmosphere in which the racing pilots met at Cleveland the day after the Thompson race last year to insist that "something be done about it."

"How long will this killing pace continue?" they asked each other. One pilot estimated that at the present mortality rate of American speedplanes and speed events, the entire coterie of flyers which now comprises the competitive personnel of American air racing would be completely wiped out in ten years.

The answer to the Klingensmith crash had been the now famous reminder to the women pilots by Clifford W. Henderson, managing director of the national races, that women had no more place in the national races than on the automobile race-track at Indianapolis.

Henderson, backed almost unanimously by the men flyers, ruled the women out of the 1934 events, and they showed their resentment at this treatment by not turning up at Cleveland, even as spectators. Amelia Earhart, who was to have flown Mary Pickford to formally open the four day program, refused the job at the last minute, and Jimmy Doolittle had to be enlisted to pilot the movie queen to the scene of the races.

But the pilots knew when they met in one of the executive rooms of the Cleveland Institute of Aviation at the

(*Continued on page 460*)

Today, Aviation flies on wings of metal, along radio lanes with instrument precision—*no place for guesswork!* Nor is there a place for guesswork at SPARTAN, including All-Metal Construction, Drafting, Blue Printing, Radio, Instruments and the other COMPLETE SPARTAN Courses coupled with the most advanced equipment under expert guidance, offer ambitious young men anxious to go forward the training to fit them for responsible positions the Industry offers today. *Aviation is going forward.* The Industry is searching for trained men. SPARTAN is placing students who qualify as quickly as they finish their courses—within our own organization we have openings for ambitious young men who have taken advantage of sound training. At SPARTAN each day's work is scheduled as a university curriculum. The silver wings of the DAWN PATROL are yours, send for the complete catalog of SPARTAN Courses—*the fastest and most economical method of entering Aviation!*

**PRICES ADVANCE**
**JUNE FIRST**

Effective June 1, 1936 due to increasing costs and more expensive equipment we are using, the prices of Spartan Courses will be materially increased. Send coupon today and get your enrolment in NOW!

# SPARTAN
## School of Aeronautics

**HOME OF THE 13 DAWN PATROL**

SPARTAN SCHOOL OF AERONAUTICS
P. O. BOX 2649, TULSA, OKLAHOMA

GENTLEMEN: Send me a copy of the NEW 1936 Spartan [illegible] and Supplement describing in detail Spartan 3 ★ ★ ★ STAR Courses of Aeronautics, tuition, detailed living expenses.

NAME _____
ADDRESS _____
CITY _____ STATE _____
AGE _____ Any Previous Flying Experience? _____

Check below branch of aeronautics you are most interested in:

☐ FLYING
☐ MECHANICAL
☐ RADIO-INSTRUMENT
☐ EXECUTIVE-MANAGEMENT

BUREAU OF PUBLIC LIBRARY, DEPARTMENT OF TECHNOLOGY

## Doug Davis

(*Continued from page 458*)

Cleveland airport that ruling the women out wasn't the whole answer—and they had Davis' death fresh in their minds as evidence.

More, these pilots themselves competitors, knew intimately the hazards of the planes and course they flew. Among them was Johnny Worthen, who finished second to Davis in the Bendix, and Lee Gehlbach, who placed third and who is a veteran of two Thompson races; Roy Minor, second-place winner in the 1934 Thompson in his spectacular, small, low-powered speedster; Walter Wedell, Jimmy's brother, and other members of what is known as the professional racing pilots chapter of the National Aeronautic Association.

They talked over Davis' crash, and reviewed the toll of air racing during the last few years, even as they made personal plans to attend Doug's funeral at Atlanta the following day. When they parted, they had agreed on the most far-reaching suggestions for air-racing safety yet made.

No aircraft, they said in effect, which may be built during the next 10 months for competition in the 1935 races, will be allowed to enter until it has been given proper stress analysis and passed inspection by a subcommittee named by the pilots themselves.

Moreover, the principal pilots favored the establishment of a 10-mile course in the major speed events. Col. Roscoe Turner, who had just won the Thompson, and Gehlbach, twice a competitor in the Thompson, agreed that great progress had been made. Speaking of the short five-mile course, sometimes used in the past, and the eight-and-one-third-mile course of this year, they said:

"Too many pylon turns put too great a strain on both machines and pilots."

Page, Liggett and Klingensmith were all killed competing over five mile courses; Davis while flying over the "compromise" eight-and-one-third-mile course to which he was said to have objected.

Further, through the National Aeronautic Association, steps are being taken to make certain that only the most competent pilots are allowed to enter major speed events. Experience in at least five sanctioned racing events and higher physical ratings will be required next year.

All of this for safety's sake, and because of the clamor which further casualties might raise, possibly endangering the entire structure of American air racing.

In fact this latter possibility was envisioned by the National Aviation Writers association, at a meeting held at the Statler in Cleveland the morning of the Thompson race. Carl B. Allen, New York aviation writer, who knows his airplanes as well as how to write about them, and who for years has made journalistic war against flying "deathtraps" in major air races led the discussion.

"The really high speed jobs of the type which have been winning the Thompson in the last two or three years ought to be eliminated until they can be made safer," he said, "Flying these ships is just like walking a tightrope. It's only a question of time before somebody else is going to come down and get hurt."

His fellow writers, for the most part, agreed. How right they were the next few hours proved. Before the sun had set they were writing the story of Davis' crash, more convinced than ever that only more safety will save speed flying.

## Strength

(*Continued from page 429*)

approx., where (d) is the diameter in inches. The section modulus for various round tubing is denoted on the nomograph.

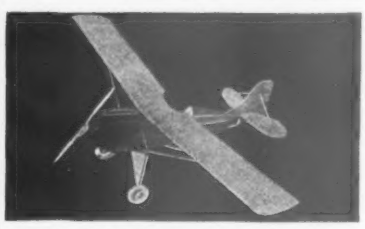
The nomograph, a seven line chart folded to make it more compact, gives you the modulus of rupture, the section modulus for various sections, and an example. You can reverse the sequences of operations but you have to connect the same scales.

The scale for rectangular sections one inch wide will simplify some of your problems, by finding the load for a one inch wide beam of the same height then multiplying the load by the width of your beam.

Loads on short beams tend to shear them at the supports. This vertical shear in connection with bending creates a horizontal shear which will be dealt with in another article.

Save this chart for we will use it in connection with other calculations.

END.

**36-INCH CORBEN SUPER-ACE**
**36-INCH FOKKER D-VII** 75c EA. add 20c postage on each kit.
Complete—nothing else to buy.

**36" CURTISS GOSHAWK** 1.00
Complete. Add 25c postage.....
Free offer not included with these kits.

**FREE** POSTAGE ON ALL ORDERS IN UNITED STATES FOR 75c OR OVER, EXCEPT WEST OF MISS. ADD 10c. CANADA, U. S. POSSESSIONS, AND FOREIGN, ADD 15%. UNDER 75c, ADD 15c.
36" Lengths, add 10c for packing.
*Send 3c stamp for illustrated Catalog. Free with order*
NO STAMPS NO C. O. D's.
ADD 5c TO EACH CHECK FOR COLLECTION.
NO ORDERS ACCEPTED FOR LESS THAN 25c.
With all orders for $1.00 or over 2 OZ. CLEAR CEMENT AND 100—1/16x1/16 BALSA **FREE**

*Dealers, Clubs, Schools: Send for Price List*
20 IN. FLYING PLANS 10c—3 for 25c
Sparrow Hawk, Boeing Trans. 247, Spad Chass., Vought Corsair, Curtiss Swift L. W., Waco Cabin Biplane, Douglas Dolphin, Boeing P-12-F, Fokker D-VII, SE5, Goshawk, Gee Bee, Boeing P26A, Fairchild 24 Cabin, Northrop Gamma, Monocoupe.

18 IN. LENGTHS
1/16x1/16.....100 for 5c
1/16x1/8..... 35 for 5c
3/32x3/32..... 32 for 5c
1/8x1/8..... 30 for 5c
1/8x1/4..... 10 for 5c
3/16x3/16..... 8 for 5c
1/4x1/4..... 5 for 5c
1/2x1/2..... 2 for 5c
18 IN. SHEETS
1/32 or 1/16x2 ..8 for 10c
1/64 or 3/32x2 ..6 for 10c
1/8x2 .....8 for 10c
3/16x2 .....3 for 9c
1/4x2 .....3 for 10c
1/2x2 .....1 for 6c
3" sheets, double these prices.
18 IN. PLANKS
1x1 1 for 4c|2x2 1 for 18c
1x2 1 for 10c|2x3 1 for 23c
1x3 .....1 for 15c
3x3 .....1 for 40c
JAPANESE TISSUE
1 doz. all colors. AA 19c
SILVER TISSUE
20"x24" .....each 5c
SUPER-FINE TISSUE
White only.
Each 5c; doz. 50c
BALSA WHEELS
1/8"... 3c 3/4"... 4c
1"... 5c 1 3/8"... 7c
2"... 10c 3"... 17c
BIRCH WHEELS
1/4"....2c 3/4"....3c
1"....4c 1 3/8"....5c
2"....10c
CLEAR DOPE
1 oz....5c 1/2 pt....30c
COLORED DOPE
1 oz. bot.. all colors...5c
CLEAR CEMENT
1 oz. bot. 5c; 2 oz. bot. 10c
1/2 pt. bot. .....35c
BAMBOO
1/16x1/16x12...36 for 5c
1/16x1/4x15. ea. 1c; doz. 10c
SHEET CELLULOID
6x8....5c 12 1/2x16...20c
CELLULOID WHEELS
3/4" pr. 5c 1 3/4" pr. 10c
2" pair 30c
1" pr. 7c 1 3/4" pr. 10c
DUMMY RAD. ENG.
1 1/4" d. 18; 2" d. 23; 3" d. 33
ENGINE AND COWL ATTACHED
1 1/4" dia. 20; 2" dia. 35
CELLULOID PANTS
1/2" to 1".....pair 18
1 3/4" to 1 7/8".....pair 33
DOWELS
1/16x6 dz.5c 1/2x18, 2 for 5c
INSIGNIA SHEETS
24 insignia and stripes 5c
WASHERS
1 doz. 1/4 or 1/2.....1c
PROPELLER BLOCKS
1/2x 3/4x 6.....6 for 5c
3/4x1 x 7.....3 for 5c
3/4x1 x 8.....3 for 5c
3/4x1 1/4x10.....2 for 5c
3/4x1 1/4x12.....1 for 4c
1 x1 1/2x12.....1 for 7c
1 x1 1/2x15.....1 for 9c
SHEET ALUMINUM
.0003x3 1/2, per ft.....1c
.005 in. thick, 6x6.....5c
.010 in. thick, 6x6.....6c
ALUM. TUBING
1/16 or 1/8, per ft.....8c
THRUST BEARINGS
Small, doz. .....10c
Large, doz. .....15c
RUBBER
1/16x1/16 or .045.18 ft. 5c
1/8 flat .....15 ft. 5c
WOOD VEN. PAPER
20x30 .....1 for 10c
METAL PROPELLERS
2 blades 3 blades
1 1/4".....08 .....10
2 1/2".....12 .....15
3 1/2".....18 .....20
4 1/2".....20 .....25
Balsa Machine-Cut Props
5".... 5c 6".... 6c
7".... 7c 8".... 8c
10".... 10c 12".... 12c
ALUM. COWLINGS
1 1/2" 15; 2" 18; 3" 25
Specify whether anti-drag, closed or open.
BOMBS
3/4" 04; 1 1/4" 07; 3" 12
GUNS WITH RING MOUNT
1 1/4" .....10; 1 3/4" .....15
PURSUIT MACH. GUNS
3/4", 1 1/4", or 1 3/4", ea. 05
WING AND TAIL LIGHTS
12" 10c; 15" 15c; 24" 20c
MECHANICAL WATER SPRAYER...15c
WIRE 2 ft. 1c; 25 ft. 10c
MODEL PINS, pkg.. 5c
THINNERS, 1 oz. bot. 5c
REED, 2 ft. ..... 1c
BUSHINGS, 1 doz.... 3c
SANDPAPER, pkg... 5c
PROP. SHAFTS, doz. 8c
NOSE PLUGS, doz...10c

**IMPERIAL MODEL AERO SUPPLY**
416-A McDonald Ave., Kensington Sta., Brooklyn, N. Y.



**Build an "IMP"**

Reg. U. S. Pat. Off. Pat. Pend.

**TORNADO MOTOR in your next job and Enjoy the Thrill of Powered Flight!**

Keep up with the newest development in model engineering by powering your models with one of these "IMP" TORNADO MOTORS. You can install it in any type model, with Motor and Generator entirely out of sight. It will swing large propellers at high speed for long, steady flights. Costs hardly anything to operate. Runs on AC:CO Gas, generated in the "IMP" Generator; a new invention that is revolutionizing model flying. Will also run on compressed air. Equally efficient for Model Boats.

Model V-4 (shown above) four cylinder. Weight only 3 1/2 oz. Will fly models from 4 to 8 feet. Complete with Generator, Feed Line and Safety Clip. **$7.50**

Model S-2, two cylinder. Weighs 2 1/2 oz. Flies models 3 to 6 feet. Complete with Generator, Feed Line and Safety Clip ..... **$5.00**

(If ordered by mail, add 25c for postage.)

**Send 3 cents** for our Latest Propeller Guide with lowest prices on genuine "IMP" Paulownia Wood Propellers. Propeller Fittings, Celluloid Dummy Motors, Balloon-tire Disc Wheels and other "IMP" Specialties, including the famous TORNADO Motors: a New 72-in. "Imp" Monoplane specially designed for these Motors, and a 64-in. Kit for the Rear Wind Speedster.

**INTERNATIONAL MODELS CO.**
1785 Broadway, General Motors Bldg., New York

# Dallas Aviation School and Air College

LOVE FIELD — *A Government Approved School — Established 1926* — DALLAS, TEXAS

# WHAT YOU SHOULD HAVE

**Among the Many Advantages IN DALLAS For Aviation Students**

1. Best flying conditions in U. S.
2. More open flying days than elsewhere.
3. Less flying hazards.
4. Commercial Aviation at its best.
5. All school operations at Love Field.
6. Love Field is one of nation's finest airports.
7. A Government approved school.
8. 55,000 square feet of space for school purposes.
9. 12 fine airplanes for student use.
10. Complete shops and classrooms.
11. Board and room at the school.
12. Every student a guest.
13. Part time work with all courses if desired.
14. Liberal transportation allowance.

*Write for catalog!*

***Everything You Want YOUR School To Be***

**T-H-I-S S-C-H-O-O-L I-S !**

The student pilot or student mechanic who comes to Dallas finds the best of everything—complete equipment, long experience, all-season flying weather. LIBERAL TREATMENT of every student, THOROUGH TRAINING in every department. Our boys like it here.

**This Is Your Special "Invite"**

to write for our new illustrated 60-page catalog and Special Centennial Price List. Send for it—see how much MORE this school has to offer you.

**Our TEXAS CENTENNIAL Enrollment**

offer is now in effect. The savings are well worth your while. The Texas Centennial (opening June 6th) is the most stupendous undertaking ever launched by an American city. Buildings and grounds cost OVER EIGHT MILLION DOLLARS. Exhibits from all over the world. Our boys will be right there!

**The President of the United States**

Will be in Dallas on June 6, for the opening of the Centennial. You will see famous people from all over the world in Dallas and at Love Field.

**You Can't *BUY* More *Why* *PAY* More?**

MORE PILOTS (Army and Civilian) learn to fly in Texas than anywhere else in the U. S. A.

**Write for our catalog. Address**

**DALLAS AVIATION SCHOOL AND AIR COLLEGE . . . .**

**Love Field . . Dallas, Texas**

## Slanguage

(Continued from page 432)

formal cadet command which means to throw your chest out as far as it will go, and put a couple of creases in your chin, and keep those eyes straight ahead.

**GIG.** A demerit. Gigs are chalked against cadets for dirty brass, unpolished shoes, wrong uniforms, etc. Each cadet is allowed so many for the week. If he accumulates more than his allowance, he spends an hour in his room for each gig over the limit while his classmates go into San Antonio on week end leave.

**HORN.** Telephone.

**HIGH-HEELS.** Girls. It's not uncommon to hear someone yelling "Jones, high heels are on the horn!" If Jones is around he comes running to talk to the girl friend.

**WHIFFLE BIRD.** A bird which flies with ever increasing velocity in circles of ever diminishing radius until the poor little fool flies down his own throat and disappears.

EDITOR'S NOTE: Cadets are requested to make additions to our dictionary of "Slanguage" and to contribute pat words from their field.

END.

*just out!* FIRST ISSUE OF
**Model Aircraft Builder**
The new publication in the Model Airplane Industry. 54 pages full of news, illustrations, plans.
10c PER COPY ON ALL NEWSSTANDS
Or write direct to MODEL AIRCRAFT BUILDER
142 West 24th St., New York

## Benny Howard

(Continued from page 426)

Giving it the gun, the plane soared away into the sky, with a roar that sounded like a powerful pursuit job. It circled the field, then flew away from the airport for about ten minutes. As it approached the field for a landing I watched it carefully—knowing that it was a "hot" ship, and therefore anticipating a fast landing. But it glided down slowly, came to rest on terra firma, rolled along the ground a surprisingly short distance, and stopped.

As Benny stepped from the plane his face was wreathed in the happy smile that spelled "Success."

"She flew just the way I knew she would," he said. "The plane lived up to all the specifications and then some."

And here's the information, or as much as Benny Howard cares to impart to the public until the completion of the Department of Commerce tests.

The plane, no name having been decided upon as yet, has hydraulic brakes, full N.A.C.A. cowling, with an all metal fuselage. The wings are of wood and steel construction, and have a ply wood covering. A Wright Whirlwind J-6-7 motor, and a controllable pitch propeller pull this ship into the skies, the motor having 285 horses, which have been souped up to 325 horse power. This fast ship will climb at a rate of 2000 feet a minute, has a cruising speed of 197 m.p.h. at 6000 feet, and a landing speed of 40 m.p.h. The top speed of this plane is estimated in the neighborhood of 230 m.p.h.

END.

## The Aviate

(Continued from page 424)

This is securely fastened to both front and rear wing spars and the elevator main spar. It is further strengthened by crossed brace wires fastened to the rear of the booms and the rear wing spar.

Easy access to the cabin is provided by the large doors and the many windows give very good visibility. The cabin itself is very roomy and comfortable. A wheel control of the throw-over type is used and will be standard equipment on the proposed production model, as will be leather covered spring cushions to fit parachute type seats.

Other equipment will include motor starter and generator, brakes and tail wheel, wheel pants, and a baggage compartment. Built-in map cases are provided and the instrument panel, of the indirectly-lighted type, carries all engine instruments, compass, airspeed indicator, altimeter, and engine and light switches. The plane is bonded and shielded for radio, and navigation lights are also provided.

Economy of operation is one of the Aviate's outstanding features, with 28 miles to a gallon of fuel, which is more than hardly anyone can boast of the family automobile. As the plane carries 16 gallons of gasoline and 7 quarts of oil, the cruising range is therefore 450 miles.

Specifications

| | |
|---|---|
| Overall Wing Span | 34'-8" |
| Overall Length | 23'-9" |
| Overall Height | 7'-2" |
| Empty Weight | 1,218 LBS. |
| Useful Load | 582 LBS. |
| Payload | 210 LBS. |
| Gross Weight (fully loaded) | 1,800 LBS. |
| Wing Loading | 9.2 LBS. SQ. FT. |
| Power Loading | 18.0 LBS. HP. |
| Top Speed (motor, 3,770 RPM) (prop., 2,000 RPM) | 115 MPH. |
| Cruising Speed (motor, 3,016 RPM) (prop., 1,600 RPM) | 100 MPH. |
| Landing Speed | 40 MPH. |
| Rate of Climb (at sea level) | 750'/min. |

END.

AERONAUTICAL ENGINEERING
DEGREE IN 2 YEARS

BACHELOR OF SCIENCE DEGREE. Course covers airplane design, propeller design, aerodynamics (including theory of airfoils, stability, performance, etc.) lighter-than-air craft, aircraft engines and all fundamentals. Equipped with a modern wind-tunnel (see illustration) capable of 100 miles per hour air speed; accommodates a 36-inch test model. Non-essentials eliminated. The technical work ordinarily required in 4 years of college given in 2¼ years. Graduates in Mechanical Engineering can complete Aeronautical course in 2 terms (24 weeks). Study and analysis of entire field of air transportation included. Flying school facilities available at nearby airports. The trained aeronautical engineer is the key man in the aviation industry. Development and progress depend on him. Students who lack high school training may make up required work, without loss of time. Enter June, September, January, March. Courses also given in Civil, Electrical, Mechanical, Chemical and Radio Engineering; Business Administration and Accounting. Living costs and tuition low. Graduates successful. Students from 48 states of the Union and many foreign countries. World famous for technical 2-year courses. **Write for catalog.** 766 College Ave., Angola, Ind.

TRI-STATE COLLEGE

NATIONAL'S NEWEST and LARGEST FLYING SCALE MODEL
"Taylor Cub"
Just in Time for Long Outdoor Flights

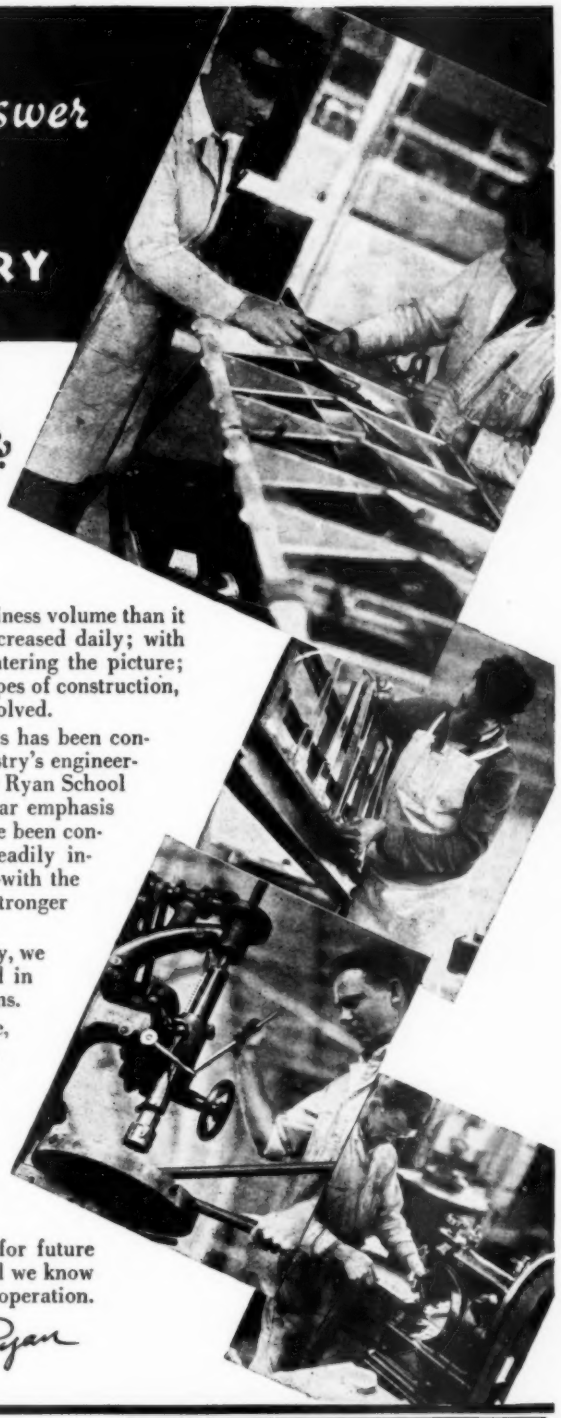
Wingspan 52½" Length 32" Weight 5 oz.
Colors: Red and White
$1.50 Plus 25c Postage

A perfect 1½" miniature of this most popular sport plane, designed for easy, quick construction and marvelous flights. Kit contains full size 3-view plans and detailed instructions, all spars and longerons to full length—28 wing ribs, nose block and propeller, semi-finished. New shock-absorbing landing gear, finished wheels, metal parts, rubber motor, tissue in colors, cement and dope. No extras to buy.

Send 5c for new bulletin and illustrated price list of new Kits and Supplies.
DEALERS! AGENTS! Write at once for discounts and details about the National Line.

NATIONAL MODEL AIRCRAFT & SUPPLY CO.
23 Avenue E Dept. PA7 New Rochelle, N. Y.

# T. Claude Ryan's Answer TO THE AVIATION INDUSTRY



T. Claude Ryan, veteran pilot and airplane manufacturer, who has been associated with such famous ships as "The Spirit of St. Louis" and the present day record breaking Ryan S-T, is also known internationally as the founder and president of the oldest school of aeronautics in the world. The "Answer" he gives here to the aircraft industry's present shortage of trained men is, therefore, both timely and important.

## TO THE INDUSTRY:

With the aviation industry now in the midst of more business volume than it has ever known before; with factory production being increased daily; with new aircraft designs and new methods of manufacture entering the picture; and with operations and maintenance keyed to advanced types of construction, your employment situation has become tremendously involved.

Aware of this situation, the Ryan School of Aeronautics has been constantly collecting data through close contact with the industry's engineering, production, and operation heads. At the same time, the Ryan School has been expanded to meet these new needs with particular emphasis placed on modern metal aircraft construction. Courses have been continuously revised and enlarged; the faculty has been steadily increased with instructors drawn direct from the industry—with the result that the school's leadership in modern training is stronger today than ever before.

Through your cooperation in helping us make this study, we have become intimately familiar with your problems and in return we are training our students to meet these problems.

As a result, we feel that Ryan, now more than ever before, is America's most modern aviation school. Furthermore, Ryan graduates are up-to-the-minute in their knowledge of the aeronautical branch in which they are specializing.

In view of all this, we are now ready to issue this unusual guarantee to you:

You can fully depend on every recommended Ryan graduate to be completely trained in all the necessary fundamentals of his particular branch, and he will fill your position with immediate ability and with initiative for future advancement. This is the Ryan answer to your problem and we know that Ryan graduates can continue to count on your full cooperation.

*T. Claude Ryan*

# RYAN SCHOOL OF AERONAUTICS

*Lindbergh Field • San Diego, California*

RYAN SCHOOL OF AERONAUTICS
Lindbergh Field, San Diego, California
I am interested in courses checked: Please send additional information.

| | | | |
|---|---|---|---|
| ☐ Transport | $1975 | ☐ Master Mechanics | $550 |
| ☐ Limited Commercial | 585 | ☐ Weems Navigation | 150 |
| ☐ Private | 585 | ☐ Aircraft Welding | 100 |
| ☐ Amateur | 395 | ☐ Aircraft Radio | 35 |

☐ Ryan deluxe Combination Course Transport training plus new Ryan S-T high performance plane 4642

Name_____ Age_____
Address_____
City_____ State_____


DEPARTMENT OF PUBLIC LIBRARY, TECHNOLOGY

## Airy Chat

(*Continued from page 400*)

POLITICS and aviation have never worked in accord, and as politics has always held the upper hand in every dispute, aviation has never progressed very far where politics held full sway. Whether the next election will see a new era for aviation or whether aviation will just get another kick in the neck is still to be seen, but we hope and pray that the next administration will hand out active assistance instead of more restrictions.

ARTHUR BRISBANE, noted columnist, has deplored the condition of American aviation for the past ten or fifteen years in his columns. We often wonder whether the dear gentleman is spoofing us or whether he just don't take the trouble to go to the airports and look at the recent developments. We dare Mr. Brisbane, just once, to speak a kind, hearty word for the able men who are really making aviation history and who should be accorded the praise that is their due.

* * *

ALMOST every year sees an old-time plane brought to light that long antedated the Wright experiments and which probably would have flown if sufficient power had been installed. This month we see that old Martin plane which raised quite a furore in its time, and which has been mentioned before in a brief way, but without the picture.

* * *

INVENTORS frequently forget that there is a depression on, or has been on according to the latest info. The net result is, that as soon as they receive their new patent with its bright gold seal and red ribbons, they start to get practical and hunt a market for their brain child.

And, one of the first things on the list is a letter requesting me to put them in touch with a few capitalists. Well, fellows I don't know any capitalists that are doing any investing just at the present time and if I did know, I could use them myself.

* * *

WELL, I just heard the whistle blow so I suppose it is time to close down this column until next month, at which time we'll have a grand reopening. So-long until then.—J. B. R.

## Viallet

(*Continued from page 424*)

APRIL 28, 1916, fell on a Friday. It was a "Black" Friday for the hard-pressed French Army. Photographs were in urgent demand by the marshal's field headquarters. Escadrille 67 was ordered to obtain the badly-needed photos at the earliest possible moment. Captain Sauveur's face went white when he realized the emergency and predicament the frantic order from HQ had put him in. The Escadrille's ships were all out on patrols. Only the unlucky Viallet, who had had motor trouble and couldn't get off with the rest, and a novice pilot, were on the aerodrome. But they would have to accomplish the dangerous mission. Escadrille 67 must not fail the high command!

Viallet, piloting a 2-seater bi-motored Caudron, took off with his gunner. He took up position on the photo plane's right with the novice on the left.

Strangely, about 13 kilometers behind the German lines, Viallet was startled to see the novice go into a power dive and head back toward the aerodrome. Circling, Viallet discovered two Fokkers diving for the tail of the fleeing novice.

Viallet's blood pounded. For a moment he couldn't decide what to do. His duty was to protect the photographic plane on its reconnaissance. Yet the novice and his gunner would surely be killed if he didn't go to their assistance. At that moment he felt the hand of his gunner behind him, tapping his shoulder. He looked back, saw his gunner pointing toward the French photographic plane. Viallet was relieved to see the gunner of that ship standing up in the cockpit waving him to go to the aid of the hard-pressed novice.

The engines of Viallet's Caudron roared with new life as he "souped" them up from cruising to full speed. As the two Fokkers banked to receive his attack, Viallet became aware of a new menace, an old German trick of murderous treachery. Down out of the heavens came a third Fokker. In the bright morning sunlight the Frenchman could see the four black crosses


# BE A PILOT • FLY A SHIP

If you are stumped at the high cost of training to qualify for a license and a good future in aviation—write, enclosing stamp, for information on our

**APPRENTICE PLAN**

**MECHANIX UNIVERSAL AVIATION SERVICE, Inc.**
Strathmoor Sta., Dept. B2, Detroit, Mich.

# AERONAUTICAL UNIVERSITY

*Founded by Curtiss-Wright*

*Government Approved - State Accredited*

AU ACCREDITED

The School the AVIATION Industry Calls on for TRAINED MEN

Right in the center of Air Transportation Industry where hiring is going on constantly.

Outstanding Faculty
Up-to-date Equipment

Reasonable Tuition — Easy Terms

*Write for Free Catalog*

**Address Dept. P. A. - Curtiss-Wright Bldg.**
**1338 S. Michigan Blvd., Chicago, Illinois**

*Try Reliable service—You will never be satisfied with any other.*

# WHOLESALE PRICE LIST

*For Dealers, Clubs, and Schools Only*
**NO ORDERS ACCEPTED FOR LESS THAN 2.50**

**Remit with order. We do not pay shipping charges. No C. O. D.'s, No Stamps. Send for Complete Price List.**

***Quantities will not be broken to less than ½ listed lots.***

**BALSA 36" LENGTHS PER 100**

1/32x1/16 .....10c
1/16x1/16 .....10c
1/16x3/32 .....18c
1/16x1/8 .....19c
1/16x3/16 .....24c
1/16x1/4 .....26c
1/16x1/2 .....60c
3/32x3/32 .....24c
1/8x1/8 .....29c
1/8x3/16 .....48c
1/8x1/4 .....52c
3/16x3/16 .....65c
1/4x1/4 .....80c
1/4x1/2 .....$1.50
1/2x1/2 ..... 2.15
1x1 ea. 6c 1x1½ ea. 11c
½x2 ea. 8c 1x2 ea. 13c
2x2 ea. 23c 2x3 ea. 32c

**36" SHEETS**

1/64x2 ....10 for 16c
1/32x2 ....10 for 14c
1/16x2 ....10 for 17c
3/32x2 ....10 for 20c
1/8x2 ....10 for 22c
3/16x2 ....10 for 31c
1/4x2 ....10 for 40c

**SHEETS 3" WIDE**
Double these prices.

**PROP. BLOCKS PER DOZEN**

¼x¾x5.5c ½x¾x6.5c
⅜x1x7 14c ⅜x1x8 17c
¾x1¼x10 .....29c
¾x1¼x12 .....34c
1x1½x12 .....38c
1x1½x15 .....52c

**HIGH GLOSS DOPE**
2 oz. bot.. doz. $1.25

**SANDPAPER**
12 pkgs. .....25c

**FREE** Your choice of DOZ. BOTTLES CLEAR CEMENT OR CLEAR DOPE, Retail Value 60c
**FREE WITH EVERY ORDER**

**WIRE, PER 100 FT.**
No. 6.20c No. 8.23c
No. 10.25c No. 12.30c
No. 14.....35c

**BALSA BALLOON WHEELS**
⅛" dz.9c ¾" dz.11c
1" dz.14c 1⅝" dz.19c
1⅞" dz.35c 3" dz.75c

**BIRCH WHEELS LIGHT and STRONG**
⅛" dz..5c ¾" dz..6c
1" dz..8c 1⅝" dz.10c
1⅞" .....dz.15c

**NOSE BLOCKS, PER DOZ.**
1x2x1 ..6c 2x2x1 .12c
3x3x1 .20c 3x3x2 .39c

**REED**
1/32 dia. ..50 ft. 15c
1/16 dia. ..50 ft. 18c
3/32 dia. ..50 ft. 20c

**DOWELS**
1/16x6" ....Gross 40c
1/8x36" 100 for $1.50

**RUBBER THREAD**
**BEST QUALITY FRESH**
.045 sq. 225 skeins 38c
1/16 sq. 225 skeins 40c
1/8 flat 225 skeins 45c
Per POUND.
1/16 or 1/8.....$1.05

**INSIGNIA SHEET —24 AND STRIPES**
1 Sheet..5c Doz..38c
100 ...$1.25 100..$1.75

**BEST BAMBOO**
1/16x1/4x15 doz...8c
1/16x1/16x12 gross 15c

**WOOD VEN. PAPER**
20x30 .....each 7c

**½" NOSE PLUGS, HARDWOOD**
1 doz...5c 100 ...40c

**THINNER**
1 oz.dz.44c 2 oz.dz.75c
½ pt...25c 1 pt...40c
1 quart.....65c
½ gal.90c 1 gal.$1.50

**BRASS EYELETS.**
1/16 I. D., 100...15c

**PROP. SHAFTS**
1 gross .....45c

**CLEAR CEMENT, DRIES QUICKLY, BEST QUALITY**
Large 5c sellers
doz. .....30c
1 oz. bottle ..doz. 45c
2 oz. bottle ..doz. 75c
2 oz. tubes..doz. $1.00
½ pint 30c 1 pint 45c
1 qt. 75c ½ gal.$1.25
1 gal.$1.75 5 gal.$7.50

**CLEAR DOPE**
Large 5c sellers
doz. .....30c
1 oz. bottle ..doz. 44c
2 oz. bottle ..doz. 75c
½ pt...25c 1 pt...40c
1 qt..65c ½ gal..90c
1 gal. ....each. $1.50

**COLORED DOPE**
Red, White, Blue, Black, Orange, Silver, Yellow, Olive Drab, Cream, Gray, Khaki.
Large 5c sellers.
doz. .....35c
1 oz. bottle..doz. 50c
2 oz. bottle..doz. 90c
¼ pt. .35c 1 pt. .50c
1 qt. 85c ½ gal. $1.35
1 gal. .....$2.25

**TISSUE "AA" 20x24**
1 doz. white.....11c
1 doz. colored....14c

**SILVER TISSUE**
20x24....per doz. 21c

**WASHERS, PER 100**
⅛ O.D. 5c ¼ O.D. 5c

**MECHANICAL SPRAYERS,** dz. $1.00

**ALUM. TUBING**
1/16 .....5 ft. 30c
⅛ .....5 ft. 32c

**SHEET ALUMINUM 12" WIDE**
.003 .....5 ft. for 50c
.010 .....5 ft. for 75c
.0003 thick 3½ wide..25 ft. for 12c

**MODEL PINS**
½" or 1".12 pkgs. 35c

**MACHINE CUT PROPS, per dozen**
5".22c 6".25c 7".31c
8".38c 10".48c 12".54c

**THREE-VIEW 20" FLYING PLANS**
Goshawk, Fokker D VII, Boeing 247, S. E. 5, S-P-A-D, Vought Corsair, Gee-Bee, Douglas Amph., Waco Cabin, Boeing P12F, Sparrow Hawk, Boeing P26A, Fairchild 24 Cabin, Northrop Gamma.
Monocoupe, 10c each
12 assorted ....75c
50 assorted ....$2.50
100 assorted .... 4.50

**THRUST BEARINGS, per dozen**
Small...8c Large..10c

**CELLULOID WHEELS,** per dozen
¾" 24 1" 25c 1¼" 35c
1½" ..60c 3" ..$1.50

**SHEET CELLULOID**
12½x16 ....each 15c
6x8 .....doz. 45c
½" to 1" Celluloid Pants ...doz. $0.80
1¼" to 1½" Celluloid Pants..doz. $1.00

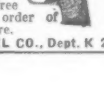
**RELIABLE DEALERS SUPPLY**
**416 Gravesend Ave., BROOKLYN, N. Y.**

**NEW FASCINATING HOBBY**

PERFECT EXACT MODELS

**THOMPSON SUB MACHINE GUN $1.50**
Construction kit with machined barrel, magazine, necessary hardware, and working plans.
Colt cal. 45 automatic kit.....$1.00
Savage cal. 32 automatic, machined barrel..... .75
Luger 9 M/M auto. with 4" machined barrel..... 1.75
Colt single action Frontier revolver..... 1.45
Send postpaid in U. S. A. No stamps please.
Checks 15c extra.

**● FREE! ●**
25 cal. Colt Automatic regular 50c kit free with every order of $2.00 or more.



These beautiful kits are complete in every detail, made of the best basswood. All parts are cut to shape and require only a short time to finish.

**GUN MODEL CO., Dept. K 2908 N. Nordica, CHICAGO**

painted on the under-wing. Boelcke's plane of winged death!

The Caudron, weighted down by two Le Rhone engines, two men—a bigger, heavier ship, slow and sluggish to respond to its control cables, was no match for the Fokker. To fight three Fokkers was sheer suicide.

Viallet was aware that it was Friday; that he was about to engage in his 13th battle; the altimeter needle pointed to 13,000 meters, and that he was somewhere around 13 kilometers behind the lines. He did not know, then that Boelcke had downed 13 brave Allied pilots and was anxious to get another victory to get away from the fateful number 13. Both airmen were caught in the meshes of the fateful 13.

Instinctively Viallet pulled the Caudron over to throw the Boche staffel commander off his dive. Devilish little darts of orange-green flame licked through the sheen of Boelcke's spinning propeller. Threatening smoking paths of white flitted toward the Caudron. Close, but not too close. It was difficult shooting from this angle. No fledgling this German Viallet decided. This was a veteran of many a battle who fired short bursts to prevent his guns from overheating and jamming.

Now Boelcke was out of position. He had missed what he had thought would be an easy kill. Perhaps his hot Teutonic temper got the better of his judgment. No one knows. But Boelcke, master flyer and strategist, committed a grave error. In blind rage he sent his Fokker's nose toward the nose of the Caudron as Viallet swung it around to give battle.

Fifty feet distant Boelcke's twin Spandaus vomitted fangs of flame. The Caudron shook as there was the thud and crackle and splintering sound of slugs gouging into wood and linen, ricochetting against metal.

The Caudron leaped up as the Frenchman worked it into a *renversement*. The sudden maneuver forced Boelcke to zoom to prevent a collision. The Fokker leaped up. And at that instant the master, Boelcke, knew that he was on the spot.

Almost before Viallet realized it he was working his Vickers. The nose-searing odor of burning powder was smashing into his face. He shouted gleefully. The Fokker, for one fleeting instant was over the top of the Caudron. There had been time for one short burst and Viallet's tracer had shown where it had gone into the Boche's ship between the spreader bars and into the Fokker's belly.

He heard the sudden stillness of the Mercedes and knew without seeing that the Fokker pilot had cocked a wing sharply. Viallet tried to snap into a roll as the Fokker came at him.

This was the climax! A dozen times before Viallet had arrived at this point. A dozen times he had ridden into the face of death. A dozen times he had thumbed the triggers and let the Vickers rock his ship and watched slugs ripping the heart out of a Rumpler, a Pfalz—but never a Fokker. A dozen times he had shot into Death's Pathway. Ten times a failure, only twice had sweet triumph been his. This was his 13th try. Unlucky 13. Unlucky pilot. Friday the 13th. And Boelcke had won 13 times!

The Frenchman yanked the stick back in his lap. The pressure against the controls was terrific. He could feel his brain, arms and legs become like lead. He lost sight of sky, earth and foe. Then he felt the force upward and the violent tremors of the Caudron as it fought off the drag of destruction.

Vision came back to his blurred eyes. He heard the hiss of escaping air and smelled the dank odor of raw gasoline. His eyes riveted on the right Le Rhone. It was literally shot to bits. (Later it was determined that 13 of Boelcke's bullets had struck the motor.)

Then hard luck descended upon


**WHAT PLANE IS THAT?**

A book that pictures, identifies and gives the vital statistics of all the leading American airplanes. Written and designed by C. A. Weymouth, Jr., with a foreword by Captain Eddie Rickenbacker. 50 full page drawings. Cloth, 8"x10". Postpaid, $1.00.
F. A. STOKES CO. Dept. P-443 Fourth Ave., New York

**THIS FLYING GAME**

By BRIGADIER GENERAL H. H. ARNOLD, Assistant Chief of the Air Corps.; and MAJOR IRA C. EAKER, Air Corps.

Here, in a lavishly illustrated volume, are the answers to the questions—How can I get into aviation?—What training do I need?—How do I acquire it?—What sort of examinations, physical and mental, need I pass?—What is the life of a flyer like?—What prospects of a job are there for the flyer who has acquired his training, and what kind of job is it anyway, this flying game? These and many other questions are competently handled by one of the foremost flyers of his day. "A great book for the youth interested in flying and wishing to know what the 'flying game' amounts to."—*Boston Globe.*

$3.00, post-paid, $3.18.

Funk & Wagnalls Company, Dept. 1594,
354 Fourth Ave., New York.

Enclosed is $3.18. Please send me, post-paid, a copy of "This Flying Game."

Name .....

Address .....

City ..... State .....

BUFFALO PUBLIC LIBRARY DEPARTMENT OF TECHNOLOGY

**$5000.00 WORTH**
**A1 CEMENT and DOPES**
**Must be Sold in Limited Time**

| Cement | Clear Dope | Colored Dope |
|---|---|---|
| 1 oz. bottle per gross ....$4.50 | 1 oz. bottle per gross ....$4.25 | Red, White, Blue, Orange, Silver, Yellow, Green, Khaki. |
| 1 pint ..... .35 | 1 pint ..... .33 | 1 oz. bot. asst. per. gr. ..$4.75 |
| 1 gallon ... 1.60 | 1 gallon ... 1.45 | 1 pint ..... .40 |
| 5 gallons... 6.50 | 5 gallons .. 6.25 | 1 gallon ... 1.90 |
| 30 gal. drum ..36.00 | | |

No orders less than $2.00 accepted. No C.O.D.'s.
All orders sent express charges collect.
**AMERICAN SALES CO.**
1592 Lincoln Place (Dept. P-2) Brooklyn, N. Y.

**PORTERFIELD TWO-PLACE CABIN AIRPLANE**
**"The Unchallenged Leader In Its Line"**

Now available with 4 makes of engines
*On Easy Time Payments*
Prices; $1,295 to $2,695 Flyaway K.C.

Easy to buy—easy to pay for—and a Ready money maker!

Right today, more than 1,200 pilots-in-the-making are using this exceptional aircraft to win their wings. And students everywhere are clamoring for this safe and sane training.

For an interesting plan of club ownership
Write

**PORTERFIELD AIRCRAFT CORP.**
2518 McGee Trafficway, - - Kansas City, Mo.

ARE YOU INVENTIVE

OTHER MEN have read and profited by our free books, "Patent Protection," and "Selling Inventions." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send free "Evidence of Invention" form. Prompt service, reasonable fees, deferred payments, thirty-seven years experience. Avoid risk of delay. Write immediately to: Victor J. Evans & Co., Registered Patent Attorneys, 727-G, Victor Building, Washington, D. C.

GAS POWERED MODEL

Most Popular Ever Built!

K-G GAS MODEL PLANS

Order NOW!

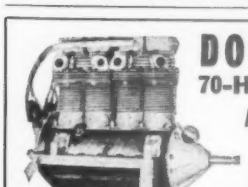
We have reprinted the full size 7-page plans and instructions as they appeared in the April and May 1935 issues of MODEL AIRPLANE NEWS. Arranged so that you don't have to cut anything. All in one unit, size 22½" x 29½". Very simple to follow. Includes list of necessary materials to build this record-breaking model. The supply is limited! The demand is increasing!

Complete Plans:

50c PER COPY POSTPAID Anywhere

MODEL AIRPLANE NEWS Suite 925-A

551 Fifth Avenue, New York City, N. Y.



DOUGLAS 70-Horsepower AIR-COOLED ENGINE

MODEL "A" CONVERSION

What every lightplane builder has been waiting for. The new Air-cooled Model "A" conversion—70 H. P. Easy to build with DOUGLAS conversion parts. Can be used on Iceboats, Snowsleds, etc. Send 25 cents in coin for information, photo and price list.

DETAILED BLUE PRINTS $3.75

H. Douglas, 936 Madison St., Oak Park, Ill.

HANDEE Tool of 1001 Uses

Does away with slow hand work. Plugs in any light socket, A. C. or D. C. 110 v. 13,000 r. p. m. For home, shop or take to job. Uses 200 different accessories.. grinds.. polishes ..routs . . drills. cuts..carves ..sands..saws . . sharpens ..engraves.

Order on our Ten-Day Money - back Trial . . . or send for FREE Catalog.

$10.75

And up Postpaid, 3 accessories FREE. Send order today.

Chicago Wheel & Mfg. Co., 1100-F Monroe St., Chicago, Ill.

See at your Dealer's

New CRAFTSMAN Project Book

"Pleasure and Profit with a Handee." Easy working plans for making many interesting and unusual projects 25c, stamps or coin.

Viallet. As the other two Fokkers, having given up chasing the novice, closed in to help their leader, the Caudron's left motor burst into flames. With leaden death brushing his burning cheek and ripping his flying coat to shreds, Viallet kicked hard right rudder. He groaned in despair. The left rudder's cable had been shot away.

Viallet pictured himself and his gunner going down 13,000 feet in a burning plane to certain death. His engines useless, his left rudder disabled, there was no hope. Only one slim chance! He put the flaming Caudron into a terrific, desperate sideslip. Flames, fanned by the sudden descent, flashed up around the cockpit. The nervy Frenchman quickly slipped his ship to the other side. The flames leaped away and out into the wing bays.

Down! Down! Down! Blazing! Smoking! Sliding! Falling in flames!

Then old Lady Bad Luck had a change of heart.

Working elevators and ailerons, Viallet succeeded in getting control of his burning plane. He was overjoyed to discover that the last long sideslip had snuffed the flames out! He nursed his bady crippled Caudron down to a clearing behind the Chaules fort.

He and his gunner just had time to crawl out of the wreckage and remove the machine guns when German artillery shells began searching the grounds to destroy the Caudron that Boelcke had marked "Doomed."

Strangely enough Boelcke was given credit for shooting Viallet down in flames. The French pilot smiled when he heard this. Vividly he remembered that he had met and parried Boelcke's savage thrust. Remembered that he had flown into the very jaws of Death. Remembered that by being still alive he had won his fight with the master German Ace. Viallet had fought a brilliant battle, his 13th—and luckiest battle!

At the close of the war Lieutenant Marcel Viallet was officially credited with 9 victories. His comrades who, after his battle with Boelcke, changed his nickname from "The Unfortunate One" to "The Lucky One," attest that he actually shot down 13 Boche planes. Viallet, himself, regards the number 13 as his lucky number.

END.

## Gates Circus

(Continued from page 452)

ered truck with its wild human cargo would start for the downtown hotel, someone would break out in a song and in a minute the whole gang would be singing at the top of their lungs. I often wonder what the civilian, respectable people of the towns we visited thought of us as we, with a yipping song on our lips, and in high tan riding boots, khaki breeches and leather jerkins, bronzed and black with dust and soot, would pull up to the entrance of the best hotel in town, and pile into a lobby full of well-dressed and "conservative" citizens. No touring stock company with its painted women and their elegant clothes could have aroused more comment than the crazy eagles of the Gates Flying Circus.

The following day, a bright warm August Sunday, all the members of the circus were on the field ready for the morning "bally" (or ballyhoo). This consisted of the entire outfit flying over or near the edge of the town and putting its crates through fifteen minutes of all known and unknown aerobatic maneuvers to let the town know we were up and ready for business. We would loop, spin and dive in formation. The more noise and more spectacular the flying the better, for the boys certainly had to live up to their name.

However, the night before, Pangborn had used my ship to stage a "Diavolo" Krantz rope ladder act and had stored all of his paraphernalia in the front cockpit. This morning, my mechanic Nick, after untying and starting the ship, asked me if he couldn't fly along on the morning's "bally." I agreed readily and Nick jumped into the front cockpit as I taxied into position with four other ships ready for the take-off.

After reaching an altitude of 3000 feet, blissfully ignorant of the unwelcome load, I proceeded to stunt near the edge of Poughkeepsie. As I pulled the ship up into a particularly wide loop, the ship hung in the up-side-down position for a moment and great was my surprise and consternation when Nick, hanging on to a strut with one hand, began to catch falling objects with the other.

I saw him catch a gasoline pail and some tools. Suddenly a heavy, unidentifiable bundle whizzed past my nose on its way down and there was nothing to do but swear. Finally, after what seemed hours, the old slow Standard's nose fell off into a dive and after completing this particular loop I sighed with relief. In those days we never even dreamed about wearing parachutes and poor Nick was in the front cockpit without even a safety belt, trusting to his arms to keep him from dropping out.

While Roy Ahearn was busy repairing his crackup, we were doing an outlandish business. The more we flew the more new customers bought tickets and the waiting line of passengers was growing longer with each minute.

(To be continued next month)

HALF the usual PRICE you've been used to paying for similar MODELS

Speedy 14 Cylinder HUGHES RACER

buys these big new C-D 20" REP Scale Flying Models

Each Kit an amazing value—with printed out wood, super-detailed drawings, finished scale wood wheels, real C-D model airplane rubber—everything—EXCEPT LIQUIDS.

ONLY A LIMITED NUMBER AVAILABLE

In realism, flying qualities and completeness of detail, these big 20" REP (Representative-Duration) beauties surpass many Kits costing twice and three times as much. Only a limited number of each model is being manufactured, so act quick! If your dealer can't supply you, order direct—by check or money order (no C. O. D.'s). Rush 3c for C-D catalog or 10c for hobby catalog.

DEALERS: Wire or Write

The Kit Hits of 1936

Kit R52, "Mister Mulligan," 50c; Kit R21, Hawk P6-E, 50c; Kit R15, Fokker D-7, 50c; Kit R54, Hughes Racer, 75c; Kit R56, Consolidated A-11, 40c. No postage charge. (English, Canadian and Mexican customers: add 10%; all others 20%). Also ready: Mr. Mulligan in ½" at 50c and ¾" scales at $2.95. And many other new models.

CLEVELAND MODEL & SUPPLY CO., INC.

1866 PA West 57th Street, Cleveland, Ohio

## Gen. Mitchell

(*Continued from page* 408)

separate air force can win a war alone. Mitchell probably overemphasized its importance just as much as his opponents underestimated its value.

The Army and Navy contend that a unified air service would not be sufficiently acquainted with the problems of land and sea forces. This objection is now being minimized as thousands of reserves and national guardsmen yearly receive training with ground troops and naval units. They are learning the problems of these services and if they are eventually welded into an aerial army with its own staff and high command, they will be able to function in coordination with their brothers-in-arms.

Billy Mitchell was a bellicose, brilliant, reckless, daring, bumptious and presumptuous general. He made himself one of the great general officers in American history. But he was primarily a war general, not a peacetime one. He functioned well as a leader of men. He inspired esprit de corps as Major General Benjamin D. "Benny" Foulois did—by refusing to send men on missions he would not himself perform.

But discipline is essential in the armed forces of the nation. He upset things even though he was more than partially right. He said he could sink a battleship from the air and astounded Navy graybeards by doing so but he proved nothing. The German cruiser "Ostfriesland" was a captured vessel and there were no defensive operations.

Mitchell said the next war will be won in the air. Many astute minds believe we will have to wait for the next war to see. There can be no doubt of the tremendous importance of the airplane in the future. The object of all warfare is the capture and enslavement (through the modern refinement known as the "treaty") of the civilian population. Insofar as the airplane serves this purpose, it will be a factor.

Meanwhile, however, observers believe that in the final analysis the old primitive cold steel against cold steel will settle international hostilities. After all, it will require an army to occupy the enemy's territory.

Did Mitchell see all this? Did he exaggerate in order to incite?

He probably did. He probably was as able a tactician as the army developed during the World War. He probably knew that by dressing his case in the gaudy clothes of exaggeration and publicity he would arouse the interest he believed it deserved.

He was not a martyr. He fought for his cause and was punished. But he didn't lose. He attracted attention and became the first great promoter of aviation in this country.

END.

## Puzzle

(*Continued from page* 412)

38—Control surface on wing.
39—The act of turning.
40—Part of seaplane.
41—To turn on an incline.
44—Type of wing rib.

DOWN

2—Aircraft meeting in battle.
4—Navigation instrument.
5—Nose down sharply.
8—Instrument that indicates direction.
9—One set of cylinders.
10—Take to the air.
11—Engine covering.
13—Pilot's term for airplane.
14—A lubricant.
16—Part of the oil system.
17—Stationary section of tail assembly.
18—One of the wings of a propeller.
19—Very strong wind storm.
23—Nearest the fuselage.
25—Toward the tail.
26—A stranded wire.
27—Main support of airplane in flight.
29—Airplane license.
30—That which gives a wing its shape.
33—Nickname of a famous flyer.
34—Strip used to hold rib together.
36—Opposite drag wires.
37—Control wire fittings.
38—Landing field.
42—Sideways.
43—Proportion.
45—Shock absorber.

*will be a "Corker"!*

**THE front cover will show the record breaking Howard Hughes' racer in full color while the back cover will display a brand new feature—the different types of camouflage employed by the U. S. Army Air Corps.**

**And between the covers, will be many new articles of merit, on the utilization of planes, descriptions of new planes and motors, the latest development in lightplanes and gliders and the new department devoted to gas models.**

***SUBSCRIBE TODAY***
***One Year Subscription $2.50***

**POPULAR AVIATION**
608 S. Dearborn St., Chicago, Ill.

**On Newsstands June 10th**

The NEW "CUB" is SAFE • ECONOMICAL • STURDY • STABLE

YOU Can Afford to Buy and Fly

The FLEET *New* "CUB"

**We teach you to fly the "CUB" FREE**

PAY ONLY **$490** Cash and Fly it home.

EASY Monthly Payments

THE smart, fleet New "CUB", the airplane the world has been waiting for, is here NOW. Fliers the world over marvelled at the 'big plane' performance and 'light car' economy of the old CUB. America's SAFE Plane—the plane that brought flying within the average man's budget. Last year only 300 CUBS **could** be made so only 300 were bought. This year production facilities have been greatly increased to accommodate the demand for America's outstanding safe, economical "flivver" plane.

The new "CUB" brings you ALL the advantages of the old "CUB" **plus** 20 improvements most of which were suggested by the hundreds of enthusiastic transport fliers who fly their CUBS nearly every day.

You can buy a "CUB" on easy terms. It costs no more than a good car and costs less to operate than the most economical small car. The cheap plane you've been waiting for is HERE . . . it's the New "CUB". Write for free folder.

**TAYLOR AIRCRAFT CO.**
No. 5 Aviation Street, Bradford, Pennsylvania

# BUYER'S DIRECTORY

Advertise in this Directory. Rates: $5.00 per inch.

## AIRPLANES FOR SALE

AEROPLANES

| | |
|---|---|
| American Eagle 1928 as is | $150.00 |
| Eaglerock, long wing, as is | 145.00 |
| Swallow 1928 as is | 225.00 |
| Le Blond motored Alco Sport | 225.00 |
| Monocoupe, requiring wing repairs | 320.00 |
| Aeromarine Klemm Lic. | 550.00 |
| Travelair 2000 Lic. | 450.00 |
| Travelair 2000 requiring repairs | 240.00 |
| Heath, less engine | 90.00 |
| New Heath B4 motor | 90.00 |

List of parts on request.

Marvin A. Northrop Aeroplane Co., Minneapolis, Minn.

## AIRPLANE PARTS AND PLANS

**BUILD THE NIMMO SPORT**

A single place high-speed sport biplane with sweepback upper wing, fitted with air brakes. Flies on any motor from 25 to 50 horse power. Easy to build, easy to fly. Complete set of blueprints $2.75. Three view drawing 75c. Complete details 10c.

**NIMMO AIRCRAFT CO.**
Box 6151 Met. Station, Dept. P.
Los Angeles, Calif.

**Professional Blueprints**
**Factory Built Parts**

**FLYING FLEA**

**Announcing:** Engine mount enclosed and engine streamlined—no square corners—door on fuselage—easier to build than ever—the world's simplest flier.

**E-Z Fuselage Kit.** Parts cut to shape, size and length. Just apply glue and drive nails and build it in a jiffy. $20.00. Will ship for $10 down, bal. C.O.D.

**E-Z Main Wing Kit, $20.00.**

Other Prices: Wheels, $2, Tires, $2.75, Control pulleys, 10c.

Complete Professional Blueprints and Full Size Wing Curve, $2.50.

Send 10c for Illustrated Circular and Price List.

**SUPERFLEA AIRCRAFT**
Lawrence, Kansas

**ALUMINUM ALLOY PISTONS**

Newest type T-Slot Pistons fitted with best quality wrist pins and oil and compression rings. Standard or oversize.

FORD A & B, CHEVROLET AND PLYMOUTH 4 (set of 4).....$ 6.00
CHEVROLET 6 AND ESSEX 6.... 10.00 (Set of 6)
FORD V-8 AND PLYMOUTH 6.... 12.00 (Set of 8 or 6)

Cam ground Pistons slightly higher. Pistons for other 2 and 4 cycle motors priced low. Specify make, model, and oversize wanted. Include deposit with order; balance C.O.D.

BAUM ALUMINUM, 1709 Gillingham St. Philadelphia, Pa.

## AIRPLANE SUPPLIES

**CLEAR NITRATE DOPE**

Sherwin-Williams No. 929 Navy Spec. 52D-2A. I accepted in trade a very few five gallon cans new dope. I will liquidate this dope at $6.00 per five gallon can f.o.b. Minneapolis. Cash with order.

MARVIN A. NORTHROP
AEROPLANE CO.
Minneapolis, Minnesota

**FOR SALE** 2 OX Eaglerocks & all parts. 1 Barling NB-3. Genet. Parts for Szekely, Leblond, Genet & OX-5 motors.

**SPECIAL** Spruce ¼x¼...¾c per ft.—⅜x¾...1c per ft. Dope...$1.35 per gal. Pigmented, (Red, yellow, blue, etc...$2.75 gal. Lightplane fabric, grade 1...1¼c per yd., grade 2...25c per yd. Casco Casein glue, ¼ lb...20c, 1 lb...60c. RF Casein glue...40c lb.

Amateurs, Homebuilders, make me your headquarters, my service special for you. Bulletin and Sales Sheet...10c

ROY P. FRY
Amateur Activities & Sales Hood River, Oregon

## PROPELLERS

**LORENZEN PROPELLERS**
*Are Made To Meet The U. S. Government Specifications*

Why not fly with the BEST and enjoy safe flying?

Cheap propellers are dangerous. Why take a chance?

**Rush a dime for our Enlarged and Newly Illustrated Catalog.**

Lorenzen Propeller Company
Dept. P.A. Niles, Michigan

## BOOKS

**Aviation Books**

Complete Stock of Books on All Aviation Subjects.

Send for Catalog.

GOODHEART-WILLCOX
2009 So. Michigan Ave., P.A. 6, Chicago, Ill.

**AERO BLUE BOOK**

For 1936 gives specifications of over 400 airplanes ranging from 20 to 7000 h.p. and nearly 100 aero engines; appraised value of many second hand planes; valuable points on buying used planes; data on choosing a flying school. Only information of its kind ever compiled. Priceless to students, engineers, dealers and flyers. Send $1 (money order, check or currency.)

AIRCRAFT DISTRIBUTING CO. $1.00 Postpaid
Dept. 6-PA
1480 Arcade Bldg., St. Louis, Mo.

## INSTRUCTION

**Information pamphlets on free Government aviation training.**

Army Air Corps Cadets get 300 hours solo flying, with salary, expenses paid. Information pamphlet, How to Apply, 20c. Same information on Navy Flying Training, 20c. Same on Marine Corps, 20c. Information on Army and Navy Schools for Aviation Mechanics, Aero Photographers, 20c. All four for 50c. Pamphlets prepared by Air Corps Veteran.

Continental Sales Co., Box 344, Dept. 11, Indianapolis, Ind.

## MODEL AIRPLANES (Ready Built)

Actual Boeing Model

**FINISHED MODELS**

Modern and wartime airplane models built to order. Fine construction; lacquered and rigged properly. Wing-spans 3 inches to 7 inches. Smooth and glossy finish guaranteed. Name your model. Price--$1.25 each. (Seaplanes, amphibians, and autogiros, $1.50 each.)

No C. O. D. orders. Canadian and Foreign duty C. O. D. Satisfaction guaranteed. Please print your name and address.
MUELLER BROS. 28 Peach Street Buffalo, N. Y.

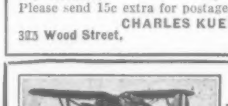
**FINISHED SOLID SCALE MODELS**

Finished solid scale models, beautifully finished in colors. Complete with movable controls, raised outline wing ribs, and diecast pilot heads in cockpit. Six models to choose from priced at $1.00 each.

| | |
|---|---|
| 7" Boeing P26 | 6½" Fokker Triplane |
| 7¾" Curtiss Goshawk | 6¾" S. E. 5 |
| 7¼" Albatross | 6¾" Nieuport 17 |

Please send 15c extra for postage.

CHARLES KUEHNE
323 Wood Street, Sistersville, W. Va.



**STUDIO MODELS CURTISS-NAVY AIR FIGHTER**

15 inch wing span with mechanical bomb dropping device. Die cast machine guns, bombs, propeller, motor, wing struts, wheel pants, cowl & ventilator. Send for literature of other models. Completely assembled & finished in Navy colors 3.50 PP. Completely painted (Ready to assemble)..... 2.50 PP.

WESTLAKE MODEL CO. DEPT. P6 ERIE, PENNA.

## MODEL AIRPLANES SUPPLIES

They're all wild about this New
**MODEL BUILDER'S KNIFE** 5c EACH at your dealer, or sent 2 for 15c postpaid

The handiest little knife! Accurately cuts minutest details. Every model builder wants one or more of them. Keen, razor edge; aluminum handle. (Pictured ½ actual size.) DEALERS: Write for prices.

6 ft. CURTISS ROBIN KIT, full size plan, tissue, glue, dope, ready cut ribs.....1.50 p.p.
5 ft. All Balsa Soaring Glider.....1.00 p.p.

WOBURN MODEL AIRPLANE SHOP, Dept. PA6, Woburn, Mass.

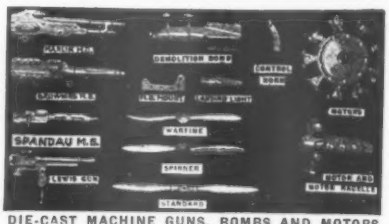
**BALSA WOOD 18"—Wholesale Only**

| | | | | | |
|---|---|---|---|---|---|
| 1/32x1/2, | 1000, 50c | 3/32x3/8, | 500, 55c | 1/32x2, | 100, 65c |
| 1/32x3/8, | 1000, 50c | 1/16x1/8, | 500, 65c | 1/32x2, | 100, 80c |
| 1/32x1/8, | 1000, 85c | 1/16x1/4, | 250, 55c | 1/32x2, | 50, 48c |
| 1/32x3/8, | 500, 57c | 1/16x1/4, | 125, 48c | 1/16x2, | 50, 50c |
| 1/32x1/4, | 500, 62c | 1/4x1/2, | 100, 70c | 1/4x2, | 25, 50c |

Order in quantity specified only. Minimum order $1.00. Prices are net F.O.B. Brooklyn. We ship C.O.D. Free complete price list. For 36" lengths double 18" price.

ART MODELAIRE
1313 Nostrand Ave. Brooklyn, N. Y.

**HURLEMAN ARISTOCRAT**
MODEL AIRPLANE MOTOR
⅞" Bore, 1" Stroke, 4500 r.p.m.
PRICE $17.50
Light weight Coils—Plugs
Send 3c Stamp for Folder
Mfg. Solely by and Obtainable Only From
WALTER HURLEMAN, INC.
1428 W. Bristol St., Phila., Pa.




**DIE-CAST MACHINE GUNS, BOMBS AND MOTORS**

MACHINE GUNS

| | |
|---|---|
| ¾" long Browning | 3c |
| 1½" Browning with pin | 5c |
| 1⅝" Spandau...pair | 15c |
| 2" long Browning | 15c |
| 2" long Marlin | 15c |
| 1½" Marlin with pin | 10c |

LEWIS GUNS

| | |
|---|---|
| 1⅜" long | 15c |
| 2" long | 20c |

MACH. GUN MOUNT

| | |
|---|---|
| For 2" guns | 5c |
| ¾" Landing Light | 5c |

DEMOLITION BOMBS

| | |
|---|---|
| ⅞" long with pin | 5c |
| 1¼" long | 10c |
| 1½" long | 15c |

CONTROL HORNS

| | |
|---|---|
| ¼" long Set of 6 | 25c |
| ½" long Set of 6 | 35c |

DIE-CAST MOTORS

| | |
|---|---|
| 1" dia. 9 cylinder | 25c |
| 1¼" dia. 9 cylinder | 35c |
| 2" dia. 9 cylinder | 50c |
| 1½" dia. 3 cylinder | 25c |

MOTOR NACELLE
For 1" dia. 9 cyl. motor 10c

PROPELLERS

| 2 BLAD. | | 2 BLAD. | | 3 BLAD. | |
|---|---|---|---|---|---|
| 2" | ST.....10c | 2¼" | SP.....15c | 1½" | ST.....10c |
| 2½" | ST.....15c | 3" | SP.....25c | 2" | ST.....15c |
| 3" | ST.....20c | 4" | SP.....35c | 2½" | ST.....15c |
| 4" | ST.....25c | 6" | SP.....50c | 3" | ST.....25c |
| 5" | ST.....30c | 2" | W.....15c | 4" | ST.....30c |
| 6" | ST.....35c | 2½" | W.....20c | 5" | ST.....40c |
| 7" | ST.....50c | 3" | W.....30c | 6" | ST.....60c |
| | | 4" | W.....40c | | |

MINIMUM ORDER 25c
No Postage

THE AIRCRAFT & MARINE MODEL CO., Dept. P.A. 6
1449 Flatbush Ave., Brooklyn, N. Y.

## PATENTS

**PATENT YOUR IDEAS**

Send me a sketch or simple model of your invention. SATISFACTORY TERMS. *DO IT NOW!*

FREE Illustrated Literature Confidential Advice

Z. H. POLACHEK
1234 Broadway, N.Y.

Z. H. POLACHEK 1234 BROADWAY PATENTS NEW YORK REG. PATENT ATTORNEY

**PATENTS**
**PERSONAL SERVICE**

My Personal service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and $5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 372-E Victor Bldg., Washington, D. C.

## MISCELLANEOUS

**Better Than Ever: IMPROVED PYROIL**

Different in color, greater in benefit and results. Yet essentially the same product used for years throughout the field of aviation. Cuts friction, reduces wear, safeguards parts, improves performance, cuts costs. Now dark wine red in color. Write for Free Chart, photomicrographic and report material. Mfrd. and Guartd. by Pyroil Co., 994 LaFollette Ave., LaCrosse, Wis.

# MINIMUM 10 WORDS CLASSIFIED DEPARTMENT RATES: 15 cents per word

### AIRPLANES FOR SALE

FOR SALE—Heath ENA-40 Parasol, licensed Sept. '36, licensed mechanic built, all instruments, compass, ball bank, tachometer, oil pressure, oil temperature, altimeter, gas gauges, airwheels, good job. 30 hours on ship, 100 on motor. For more information write.—Howard Carlson, 3832 N. Troy St., Chicago, Ill.

USED AIRPLANES $50.00 AND UP—"Easy Payments." Literature 10c.—Continental Sales, Box 344, Dept. 11, Indianapolis, Ind.

FOR SALE—Curtiss Jr., NC10914. Just majored, $395.00. Cash Flyaway.—Al. Gardner, Conneaut, Ohio.

FOR SALE—Identified Arrow Sport A.2. Perfect shape less motor, Velie mount, licensable with Le Blond. Quick Sale, $150.00.—Sidney Woolf, Jr., Lynch, Nebr.

AEROMARINE-KLEMM Low Wing, 65 H.P. motor, 90 hours, total. Airwheels, brakes, speedring, compass, 2 altimeters, airspeed, bank indicator, clock. Wobble pump for extra tank, safe and economical, a beautiful ship in perfect condition, licensed until October. $600. Ship at Sky-Harbor Airport.—George Kropp, Ravinia, Ill.

1935 RELIANT STINSON. Total hours 250. Equipped with Radio, landing lights, large gas tanks, and full set of flying instruments. Priced to sell. Can be seen at Aurora Airport.—Ted Ilseman, 260 South Highland Avenue, Aurora, Illinois.

### PHOTOS

AIRPLANE PHOTOGRAPHS FOR SALE AT 35 for $1. Satisfaction guaranteed.—Roger Perrault, Lyndonville, Vt.

FILMS DEVELOPED—Any size, 25c coin, including two enlargements. CENTURY PHOTO SERVICE, Box 829, La Crosse, Wis.

PHOTOGRAPHS—Aviators, Planes, Celebrities, Scenic. All sizes. Sample and price list, 10c.—Ralston Photos, 612 No. Denny, Indianapolis, Indiana.

### AIRPLANE PARTS AND PLANS

LIGHT AIRCRAFT DESIGN, Structural Drafting, Blueprints, Estimates, Etc. Write for information.—Peyton Autry, Boonville, Indiana.

COMPLETE PLANS FOR FLEA, $0.65. Aircraft supply catalog DIME; reduced prices on all flea parts list .04 stamps.—Kamm Aircraft Co., 524-12th Street, Oshkosh, Wis.

CANADIANS—Motors, Parts, and material for The Flying Flea and other light planes. Send dime for list.—Hoyt's Aviation Supplies, Orillia, Ontario.

BUILD your own Midget Car or Lightplane from Storms Plans. Engines, air propellers, hubs, chains, axles, wheels, etc., at low prices. Circulars, 10c.—Storms Aviation Co., 13 Southside. Asheville, N. C.

### ENGINES

FOR SALE—REASONABLE. LeBlond 5-D-60 H.P. Motor, complete or any part. Also many extra parts. For information write V. F. MacDonald, 11646 Mack Ave., Detroit, Michigan.

### MISCELLANEOUS

WANTED—1928 or 29 Swallow three place fuselage, Willard Holloway, Fairmount, Ind.

Typewriters, Adders, Circulators, and Office Supplies. We also buy for CASH. Write today for Catalog.—PRUITT, 722 Pruitt Bldg., Chicago.

HERE IS YOUR CHANCE to make enough money to get in aviation. Due to other interests, I will sell the plans of my small mail-order business. My income from this plan during past year was over $5,000. Complete plans are .50 (coin).—Arnold Gayne, 20 Terrace Rd., Franklin, N. H.

AERODRIVE PROPELLER, boat attachment, detailed blueprint, 25c. Propellers for generators, icesleds, boats, airplanes, $1.75 up.—Aircraft Supplies, Ostergaard Aircraft, Parr, Indiana.

BARGAINS!—Microscopes, Telescopes, Binoculars. Catalog Free.—Teeko, 515A, Evanston, Illinois.

RADIO ENGINEERING, broadcasting, aviation and police radio, **Servicing**, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free.—Dodge's Institute, Davis St., Valparaiso, Ind.

Complete airplane plus course in aeronautics, $300! Builders' supplies cheap! Send stamp for details.—Merle Larson, Bridgewater, S. Dak.

WANTED—Pilots with planes to fly an air show circuit. From freaks to good planes.—Coffman Air Show, Clinton, Oklahoma.

## Stepping Stones

(*Continued from page* 422)

"Question Mark" into a $25,000 prize for crossing from Paris to New York, and thence on to Dallas, Texas, with only one stop en route. It was, incidentally, the first successful east to west non-stop crossing from Paris to New York.

The aviation spotlight was turned on Croydon Field in October, 1934, when a group of ambitious pilots took off in the London to Melbourne air derby in competition for $75,000 in prize awards. A couple of days later Scott and Black led the field across the finish line to capture $50,000 of that sum.

These are only random selections from the array of prize offers that have inspired airmen during the last few decades. Random selections from a total that runs into several millions of dollars . . . . but enough to demonstrate that these pots of gold have indeed been the stepping stones of aviation.

And in the future, it would seem that progressively greater and greater prizes or awards must be offered in order to make the winning of the contest worthwhile. The size and cost of the planes and engines continually increases with each successive meeting, the upkeep of the personnel and other expenses increase correspondingly. But, on the other hand, the commercial benefits to be derived are also greater if advertising is the objective.

END.

## Barter and Exchange

Notices in these columns are confined to trades. Cash sale advertising must be inserted under the Directory or Classified columns. Notices in the Barter and Exchange columns, fifteen cents per word.

### AIRPLANE PARTS

SALE OR TRADE—V. Heath parts, fuselages, wings, many other parts too numerous to mention.—Arrow Trades, Star Lake, Wisc.

SELL OR TRADE—50 inch Waco Custom Cabin with **M & M** airwheels, aluminum cowl, pawlawnia wood prop., beautiful flyer, doped all silver, $10.00; also 22 cal. rifle, $5.00. Or trade both for $7.00 -4 or 16x7x3 airwheels with hubs, tires and tubes complete.—Kenneth H. Goodsell, 26 Highland Ave., Bethel, Conn.

TWO PAIR shatterproof goggles with sponge mask, $5.00 or ?—Edward Anthony, Box 14, Texas City, Texas.

SALE—TRADE—Herbest Special outboard, Class B, all mahogany. 35MPH with 22HP., 9MM Squirrel and 12G Shotguns, Remington 12A-22 octagon barrel target model rifle. All A-1 condition. Wanted—Light two-place airplane. All offers considered. May be needing repairs.—Harry Wittmer, 116 N. LeClair Ave., Chicago, Ill.

I HAVE a dirt track racer in excellent shape. It has a new motor with dome top, high compression pistons, new crankshaft and camshaft, with main bearings drilled and dips on connecting rod bearings mag, sixteen valve roof head and dual carburetors, Dayton racing wheels and Art Chevrolet racing rear end. Will do about 112 miles per hour. Will trade preferably licensed OX Bird Travelair, Waco 10, or light air cooled job. Will consider cracked two or three place air cooled job. Will give or take cash.—Berdell Quakenbush, 1514 East Washington St., Muncie, Ind.

"SWAP—22 Baby hammerless, for Benjamin Air-pistol. Swap—40 colored pictures of famous aviators for what have you?"—E. Kent, 143 Peter St., Buffalo, N. Y.

SELL OR TRADE Heath Henderson motor, Heath welded fuselage, tail group, landing gear, motor mount and struts.—Rex Garrett, New Windsor, Ill.

HAVE PAIR 24x4 wheels, tires, tubes, Jones Tachometer, Altimeter. Reasonable. — Sanders Hudson, Jr., East Durham, N. Car.

### MOTORS, ENGINES, ETC.

NEW 213 Cu. in. motor, 110 horsepower, 238 lbs. Built on '32 Ford Crankcase. Special head, ignition, camshaft, cylinders, pistons. Uses two carbureters. $175 or trade. Aeronca or similar motor. Mun-Gar Motorkraft Co., 1400 Oread, Lawrence, Kan.

WANTED—One or two cylinder model gasoline engines. Give make, condition, dimensions in first letter; also price. I have books, cameras, etc., to trade; also cash.—Earl Suchy, 5216 S. Emerald Ave., Chicago, Ill.

HAVE a two-cylinder Indian Motor in good running order, 1 five-tube Atwater-Kent Radio. Will trade either one or both for revolver, depending on make and condition of revolver.—William Chapman, Drawer N, Norway, Mich.

SALE OR TRADE—Aeronca 30 Horsepower Motor; Lawrence 2 cylinder.—Arrow Trades, Star Lake, Wisc.

### AIRPLANES, ETC.

AMERICAN EAGLE, identified, double ailerons, streamline wires, good covers, flies well. Also 2-place factory built sportplane less motor. Want 1934 or 1935 car. Will add cash or sell cheap.—Lawrence Allison, Lawrence, Kan.

KARI KEEN for sale or trade. Two-place cabin, Velie motor, new prop. Needs some work. Make me an offer.—Frank Fisher, Big Sandy, Mont.

1929 HARLEY 74, new paint, just overhauled, perfect mechanical condition. Extras. Want Heath V, Church, Centerwing needing motor repairs. Write your offer.—Herbert Harmon, 2226 Lyndon Ave., Chattanooga, Tenn.

FOR SALE OR TRADE—Two-place Monoplane. Less motor; just been rebuilt. It will take any 60 HP light plane motor.—Write to Archie Carr, R. 1, Brookville, Pa.

WILL TRADE OX5 three-place Air King for late model motorcycle, auto or sell for $300 cash.—Jack C. Lester, 181 Gordon Ave., Rome, Ga.

WANTED—Heath Fuselage, prefer bolted type, minor crackup O. K. Also need tubing and sheet metal. Have two rifles to trade or cash.—Steven Ondra, 21 McEldowney St., Chicago Heights, Ill.

GREAT LAKES Trainair. Used for amusement and pilot trainer. Run by 10 horsepower electric motor. Complete for best offer, or trade for House Trailer.—John T. Lynch, 6242 S. Whipple, Chicago, Ill.

XUM

# AERONAUTIC PUBLICATIONS OF THE RONALD PRESS COMPANY

ESSENTIAL FOR SAFE FLIGHT:

## Airplane Mechanics Rigging Handbook

**by R. S. Hartz,** *formerly Lieut. Colonel Air Corps, U. S. Army; and* **Lieut. E. E. Hall,** *formerly Editor, "Aircraft Servicing."* 104 *illustrations.* **$3.50.**

This book covers in detail the care and handling of airplanes on the ground and in the shop; sequence of rigging steps; how to true up the assembled ship; how to adjust the wings and control surfaces for "hands off" flying; spars and struts; inspection; installing and checking compasses; fabric; wood and glue; metal parts; wire; dopes and doping; folding and packing parachutes. It shows you how to get a plane into proper flying condition and how to keep it that way.

EVERY AIRMAN NEEDS THIS BOOK:

## Aircraft Radio

**by Lieut. Myron F. Eddy,** *U. S. Navy. Retired.* 68 *illustrations.* **$3.00.**

The only complete guide to the principles, equipment, installation, operation, and maintenance of aircraft radio. Tells how it is used in aerial navigation, with complete details about apparatus, radio beacons, instrument-board visual indicators, etc.; how weather data and flight orders and reports are exchanged between airplanes and ground stations; how radio sets are installed in planes, and how the plane is electrically bonded and shielded to eliminate interference; how to service radio sets; full details of specific circuits, etc.

A PRACTICAL GUIDE FOR PILOTS:

## Navigation of Aircraft

**by Lieut. Logan C. Ramsey,** *U. S. Navy; Instructor in Aerial Navigation, Pensacola Naval Air Station.* *51 illustrations.* **$4.50.**

Covers the practical, everyday sort of navigation every pilot must know. Emphasizes dead reckoning, including plotting, course setting, determining and correcting for wind effects, etc. Piloting and navigation by aerial astronomy are also fully explained. In addition to its major presentation of the principles and practice of position finding by calculation and observation, the manual covers fully maps, instruments, and accessories; compasses; navigational practice, etc.

Fill in, tear out, and mail

**Sent on 5 Days' Approval**

The Ronald Press Company
Dept. M139, 15 East 26th St., New York

Send me the books checked below with the privilege of examination before purchase. Within five days after books are received I will return any that are not satisfactory and remit for those I keep at the price shown plus a few cents for delivery. (We pay delivery on orders accompanied by cash; same approval privilege.)

- ☐ **Lusk,** Aeronautics ..... $3.25
- ☐ **Moors,** Engine Manual ..... 4.50
- ☐ **Hartz-Hall,** Rigging Handbook ..... 3.50
- ☐ **Eddy,** Aircraft Radio ..... 3.00
- ☐ **Ramsey,** Navigation ..... 4.50

Name .....
Home Address .....
City ..... State* .....

☐ Employed by,
☐ or Reference .....
(Must be filled in unless you send cash)

Address .....
*If outside continental U. S. and Canada, send cash plus 25c per book for shipping.

## *Can you answer these questions?*

The compass reading is 230°, the variation is 18° E, the deviation is 7° W. Determine the true heading.

What would you do to get a plane out of a tail-spin?

What is the purpose of a condenser in the ignition system?

How is the torque of the propeller balanced in rigging a plane? Why is the vertical fin sometimes slightly offset?

What are 8 significant landmarks that are shown on good avigation maps which may be identified easily from the air?

What is the effect of having an adjustable stabilizer too high when landing?

What are four basic cloud forms? What is the approximate altitude at which they occur? What flying conditions do they indicate?

In flying out of a small field, is a small or large propeller pitch desirable?

***This book answers them—and hundreds more:***

# Aeronautics
## A Ground School Text Book

by Hilton F. Lusk, Transport Pilot; formerly Dean, Boeing School of Aeronautics. 175 illustrations. **$3.25**

This is a complete ground school course in handy book form. It clearly and thoroughly explains all the subjects you need to understand to pass the written part of the government examinations for a license as an airplane pilot in any of the grades—including transport pilot, or as an airplane or engine mechanic. No one who masters this book need fear any difficulty in answering any question that may be asked in the government examinations. So clearly and simply written that you will have no difficulty in grasping its explanations, even if you must study at home without the aid of an instructor. 224 questions like those asked in the official examinations help you test your understanding on each subject.

CONDENSED OUTLINE: **Principles of Flight:** Explains all the essential aerodynamic factors and their application to airfoils. **Airplane Construction and Operation:** Principles of construction and materials employed. Methods for working wood and fabric. Welding metal planes and parts. Flying. Elementary acrobatics. **Propellers:** Theory, Construction and maintenance of wood and metal propellers. Variable pitch propellers. **Engine Construction and Operation:** Theory. How to determine engine efficiency. Types of engines, construction materials. Fuel systems, carburetors, ignition systems. Engine operation and maintenance. **Blind Flying Instruments:** Use of attitude instruments in blind flying. Absolute and relative references. Inclinometers. Pitch, roll, turn indicators. Operating principles of gyroscopic instruments. **Engine Instruments:** Construction and operation of tachometers, pressure gages, thermometers, fuel quantity gages. **Safety Appliances:** Parachutes; Aircraft radio, antenna details, shielding methods, etc.; radio range beacons and markers. **Aviation Maps and Piloting:** Explains and illustrates various map projections and their use in avigation. Practical hints on piloting. **Dead Reckoning:** Details of methods with solutions of practical problems. **Avigation Instruments and Equipment:** Describes and illustrates each of the avigation instruments found in aircraft and explains theory so you can understand principles on which it operates. **Principles and Applications of Meteorology:** Effects of winds, storms, visibility in relation to flight.

## *—and questions like these?*

What does excessive wear on one side of a piston usually indicate?

What is the difference between the back-suction and needle valve types of mixture control?

How is the actuating coil of the current regulator connected to the armature circuit?

How is the alignment of crankshaft checked?

How is the exact top-center found preparatory to valve-timing the Curtiss Conqueror engine?

What points should be covered in the maintenance of an Eclipse inertia starter?

How are the contact points of the Scintilla SC magneto adjusted?

How would you check the ignition-timing of an engine?

How is the track of a propeller checked after it has been installed?

What are the principal points to cover in the 25-hr. inspection of an engine?

What is the purpose of the glow-plugs used in the Packard-Diesel aircraft engine?

What three ignition troubles may result in difficult starting?

How will too much valve-tappet clearance affect the operation of an engine?

***You'll find the answers in this famous book:***

# Aircraft Engine Mechanics Manual

by C. J. Moors, Chief Instructor, Dept. of Mechanics, Air Corps Technical School, U. S. Army. 189 illustrations. **$4.50**

This book covers the same ground as the course given the enlisted mechanics of the Army Air Corps with the addition of much data on types of equipment suited only to commercial airplanes. It deals thoroughly with all kinds of aircraft engines and their accessories. It explains exactly how they operate and the features in which the various makes of competing equipment resemble each other and those in which they differ.

Mr. Moors gives all needed data on construction and operation, supplies full instructions for proper maintenance, and shows you exactly how to go about making any necessary repairs and adjustments. Particularly important is the detailed information on locating causes of engine troubles. The book is lavishly illustrated; photographs, diagrams, and working drawings make it easy for you to follow each explanation. 400 questions enable you to test your understanding of each subject treated.

**Among the engines dealt with are:** Pratt & Whitney Wasp, Wasp Junior, Hornet; Wright Whirlwind, Cyclone; Curtiss D-12, Conqueror, Challenger; Lycoming; Packard-Diesel; Warner-Scarab; Kinner; LeBlond; Continental; Liberty. **Equipment covered includes:** Scintilla Magnetos, Types AG and V-AG, Double Magneto Type SC, N Series; Eclipse and Leece-Neville Electric Generating Systems; Delco Battery-Generator Ignition System; Eclipse Engine Starters; Zenith and Stromberg Carburetors; Superchargers; Cooling and Lubricating Systems, etc., etc.

***← Mail this coupon—books sent for 5 days' trial***